

Product Overview

The NSI83x devices are high reliability triple/quad-channel digital isolators. The NSI83x device is safety certified by UL1577 and supports 5kV_{rms} insulation withstand voltage, while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of the NSI83x is up to 100Mbps, and the common-mode transient immunity (CMTI) is up to 200kV/us. The NSI83x device provides digital channel direction configuration and the default output level configuration when the input power is lost. Wide supply voltage of the NSI83x device supports connection to most digital interfaces directly, making level shifting easy. High system level EMC performance enhances reliability and stability of use.

Key Features

- Up to 5000V_{rms} Insulation voltage
- Data rate: DC to 100Mbps
- Power supply voltage: 2.5V to 5.5V
- High CMTI: 200kV/μs
- Chip level ESD: HBM: ±8kV
- Robust Electromagnetic Compatibility (EMC)
 - System-Level ESD, EFT, and Surge Immunity
 - Low Emissions
- Default output high level or low-level option
- Low power consumption: 1.5mA/ch (1 Mbps)
- Low propagation delay: <18ns
- Operation temperature: -40°C~125°C
- RoHS-compliant packages:
 - SSOW16

Safety Regulatory Approvals

- UL recognition: up to 5000V_{rms} for 1 minute per UL1577
- CQC certification per GB4943.1
- CSA component notice 5A
- DIN EN IEC 60747-17 (VDE 0884-17)

Applications

- Industrial automation system
- Isolated SPI, RS232, RS485
- General-purpose multichannel isolation
- Motor control

Device Information

Part Number	Package	Body Size
NSI834xWx-DSSWR	SSOW16	5mm × 7.50mm
NSI833xWx-DSSWR	SSOW16	5mm × 7.50mm

Functional Block Diagrams

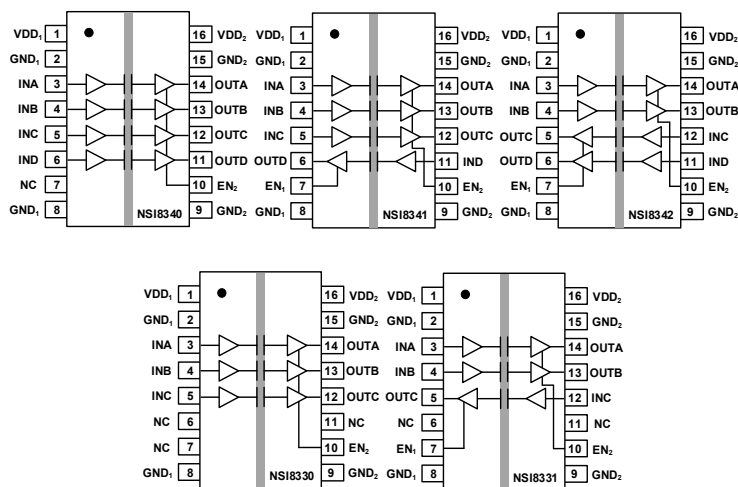


Figure 1. NSI83x Block Diagram

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1. Pin Configuration and Functions

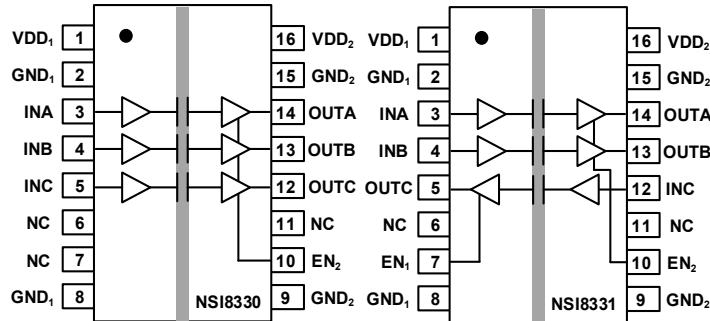
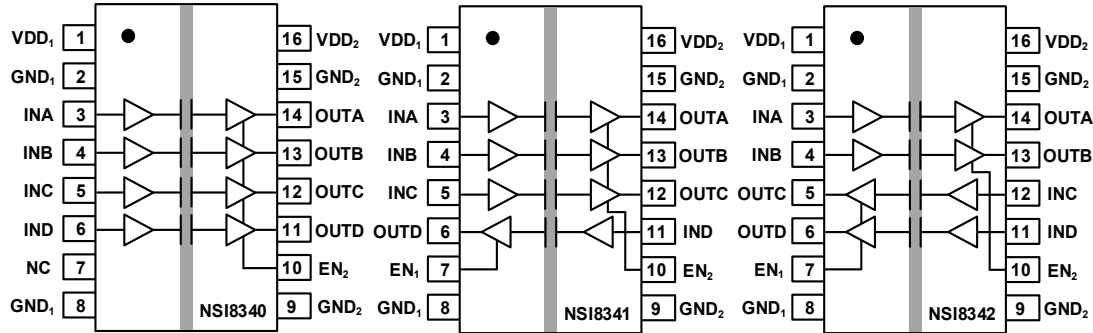


Figure 1.4 NSI8330 Package

Figure 1.5 NSI8331 Package

Table 1.1 NSI834x Pin Configuration and Description

NSI8340 PIN NO.	NSI8341 PIN NO.	NSI8342 PIN NO.	SYMBOL	FUNCTION
1	1	1	VDD ₁	Power Supply for Isolator Side 1
2	2	2	GND ₁	Ground 1, the ground reference for Isolator Side 1
3	3	3	INA	Logic Input A
4	4	4	INB	Logic Input B
5	5	12	INC	Logic Input C
6	11	11	IND	Logic Input D
7	7	7	NC/EN ₁	No Connection (NSI8340). Or Output Enable 1 (NSI8341/2). Active high logic input. When EN ₁ is high or NC, the output of Side 1 is enabled. When EN ₁ is low, the output of Side 1 is disabled to high impedance state.
8	8	8	GND ₁	Ground 1, the ground reference for Isolator Side 1
9	9	9	GND ₂	Ground 2, the ground reference for Isolator Side 2

10	10	10	EN ₂	Output Enable 2. Active high logic input. When EN ₂ is high or NC, the output of Side 2 is enabled. When EN ₂ is low, the output of Side 2 is disabled to high impedance state.
11	6	6	OUTD	Logic Output D
12	12	5	OUTC	Logic Output C
13	13	13	OUTB	Logic Output B
14	14	14	OUTA	Logic Output A
15	15	15	GND2	Ground 2, the ground reference for Isolator Side 2
16	16	16	VDD2	Power Supply for Isolator Side 2

Table 1.2 NSI833x Pin Configuration and Description

NSI8330 PIN NO.	NSI8331 PIN NO.	SYMBOL	FUNCTION
1	1	VDD ₁	Power Supply for Isolator Side 1
2	2	GND ₁	Ground 1, the ground reference for Isolator Side 1
3	3	INA	Logic Input A
4	4	INB	Logic Input B
5	12	INC	Logic Input C
6	6	NC	No Connection.
7	7	NC /EN ₁	No connection (NSI8330) Or output Enable 1 (NSI8331). Active high logic input. When EN ₁ is high or NC, the output of Side 1 is enabled. When EN ₁ is low, the output of Side 1 is disabled to high impedance state.
8	8	GND ₁	Ground 1, the ground reference for Isolator Side 1
9	9	GND ₂	Ground 2, the ground reference for Isolator Side 2
10	10	EN ₂	Output Enable 2. Active high logic input. When EN ₂ is high or NC, the output of Side 2 is enabled. When EN ₂ is low, the output of Side 2 is disabled to high impedance state.
11	11	NC	No Connection.
12	5	OUTC	Logic Output C
13	13	OUTB	Logic Output B
14	14	OUTA	Logic Output A
15	15	GND2	Ground 2, the ground reference for Isolator Side 2
16	16	VDD2	Power Supply for Isolator Side 2

2. Absolute Maximum Ratings

<i>Parameters</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Comments</i>
Power Supply Voltage	VDD1, VDD2	-0.5		6.5	V	
Maximum Input Voltage	VINA, VINB, VINC, VIND	-0.4		VDD+0.4	V	The maximum voltage must not exceed 6.5V
Maximum Output Voltage	VOUTA, VOUTB, VOUTC, VOUTD	-0.4		VDD+0.4	V	The maximum voltage must not exceed 6.5V
Maximum Input/Output Pulse Voltage	VINA, VINB, VINC, VIND, VOUTA, VOUTB, VOUTC, VOUTD	-0.8		VDD+0.8	V	Pulse width should be less than 100ns, and the duty cycle should be less than 10%
Output current	I _o	-15		15	mA	
Operating Temperature	T _{opr}	-40		125	°C	
Junction Temperature	T _j			150	°C	
Storage Temperature	T _{stg}	-65		150	°C	

3. ESD Ratings

<i>Parameters</i>	<i>Ratings</i>	<i>Value</i>	<i>Unit</i>
Electrostatic discharge (ESD)	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽²⁾	±8000	V
	Charged device model (CDM), per JEDEC specification JESD22-C101 ⁽³⁾	±2000	V

(1) Though this device features proprietary protection circuitry, proper ESD precautions should be considered to avoid performance degradation of damage due to high energy ESD event. Charged devices and circuit boards may discharge without detection.

(2) Safe manufacturing requires 500-V HBM and standard ESD precautions, per JEDEC document JEP155.

(3) Safe manufacturing requires 250-V CDM and standard ESD precautions, per JEDEC document JEP157.

4. Recommended Operating Conditions

<i>Parameters</i>	<i>Symbol</i>	<i>min</i>	<i>typ</i>	<i>max</i>	<i>unit</i>
Power Supply Voltage	VDD1, VDD2	2.5		5.5	V
Operating Temperature	T _{opr}	-40		125	°C
High Level Input Voltage	V _{IH}	2			V
Low Level Input Voltage	V _{IL}			0.8	V
Data rate	DR			100	Mbps

5. Thermal Information

Parameters	Symbol	SSOW16	Unit
IC Junction-to-Air Thermal Resistance	$R_{\theta JA}$	78.9	°C/W
Junction-to-case (top) thermal resistance	$R_{\theta JC (top)}$	41.6	°C/W
Junction-to-board thermal resistance	$R_{\theta JB}$	43.6	°C/W
Junction-to-top characterization parameter	Ψ_{JT}	9.4	°C/W
Junction-to-board characterization parameter	Ψ_{JB}	27.0	°C/W

6. Specifications

6.1. Electrical Characteristics

(VDD1=2.5V~5.5V, VDD2=2.5V~5.5V, Ta=-40°C to 125°C. Unless otherwise noted, Typical values are at VDD1 = 5V, VDD2 = 5V, Ta = 25°C)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Power on Reset	VDD _{POR} ⁽¹⁾	2	2.2	2.4	V	POR threshold as during power-up
	VDD _{HYS} ⁽¹⁾		0.1		V	POR threshold Hysteresis
Rising input switching threshold	V _{IT+} ⁽¹⁾		1.5	2	V	
Falling input switching threshold	V _{IT-} ⁽¹⁾	0.8	1.15		V	
Input threshold voltage hysteresis	V _{IT_HYS} ⁽¹⁾		0.35		V	
High Level Output Voltage	V _{OH}	VDD-0.4			V	I _{OH} = -4mA
Low Level Output Voltage	V _{OL}			0.4	V	I _{OL} = 4mA
Output Impedance	R _{out} ⁽¹⁾		50		ohm	
Input Pull high or low Current	I _{pull}		5	10	μA	
Start Up Time after POR	tr _{bs} ⁽²⁾		22	32	μs	
Common Mode Transient Immunity	CMTI	±150	±200		kV/μs	See Figure 6.15 , C _L = 15pF
⁽¹⁾ Not test covered, guaranteed by characterization.						

⁽²⁾ Not test covered, guaranteed by design.

6.2. Supply Current Characteristics – 5V Supply

(VDD1=5V± 10%, VDD2=5V± 10%, Ta=-40°C to 125°C. Unless otherwise noted, Typical values are at **VDD1 = 5V, VDD2 = 5V, Ta = 25°C**)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Supply current	NSI8340					
	I _{DD1} (Q0)		1.48	1.74	mA	All Input 0V for NSI8340x0 Or All Input at supply for NSI8340x1
	I _{DD2} (Q0)		4.28	5.10	mA	
	I _{DD1} (Q1)		6.20	7.44	mA	All Input at supply for NSI8340x0 Or All Input 0V for NSI8340x1
	I _{DD2} (Q1)		4.30	5.14	mA	
	I _{DD1} (1M)		3.93	4.71	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		4.37	5.29	mA	
	I _{DD1} (10M)		4.16	5.20	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		5.80	7.00	mA	
	I _{DD1} (100M)		4.77	5.95	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		26.39	32.99	mA	
	NSI8341					
	I _{DD1} (Q0)		2.18	2.58	mA	All Input 0V for NSI8341x0 Or All Input at supply for NSI8341x1
	I _{DD2} (Q0)		3.58	4.26	mA	
	I _{DD1} (Q1)		5.72	6.86	mA	All Input at supply for NSI8341x0 Or All Input 0V for NSI8341x1
	I _{DD2} (Q1)		4.77	5.71	mA	
	I _{DD1} (1M)		4.04	4.85	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		4.26	5.14	mA	
	I _{DD1} (10M)		4.57	5.65	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		5.39	6.55	mA	
	I _{DD1} (100M)		10.17	12.71	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		20.98	26.23	mA	
	NSI8342					
	I _{DD1} (Q0)		2.88	3.42	mA	All Input 0V for NSI8342x0 Or All Input at supply for NSI8342x1
	I _{DD2} (Q0)		2.88	3.42	mA	

Parameters	Symbol	Min	Typ	Max	Unit	Comments
	I _{DD1} (Q1)		5.25	6.29	mA	All Input at supply for NSI8342x0 Or All Input 0V for NSI8342x1
	I _{DD2} (Q1)		5.25	6.29	mA	
	I _{DD1} (1M)		4.15	5.00	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		4.15	5.00	mA	
	I _{DD1} (10M)		4.98	6.10	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.98	6.10	mA	
	I _{DD1} (100M)		15.58	19.47	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		15.58	19.47	mA	

Parameters	Symbol	Min	Typ.	Max	Unit	Comments
Supply current	NSI8330					
	I _{DD1} (Q0)		1.40	1.78	mA	All Input 0V for NSI8330x0 Or All Input at supply for NSI8330x1
	I _{DD2} (Q0)		4.14	5.03	mA	
	I _{DD1} (Q1)		4.94	5.99	mA	All Input at supply for NSI8330x0 Or All Input 0V for NSI8330x1
	I _{DD2} (Q1)		4.15	5.06	mA	
	I _{DD1} (1M)		3.24	3.94	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		4.20	5.17	mA	
	I _{DD1} (10M)		3.41	4.31	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		5.28	6.45	mA	
	I _{DD1} (100M)		3.87	4.87	mA	All Input with 100Mbps, C _L =15pF
	I _{DD2} (100M)		20.72	25.95	mA	
	NSI8331					
	I _{DD1} (Q0)		2.74	3.35	mA	All Input 0V for NSI8331x0 Or All Input at supply for NSI8331x1
	I _{DD2} (Q0)		2.80	3.39	mA	
	I _{DD1} (Q1)		5.10	6.21	mA	All Input at supply for NSI8331x0 Or All Input 0V for NSI8331x1
	I _{DD2} (Q1)		3.99	4.84	mA	
	I _{DD1} (1M)		3.98	4.88	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.46	4.23	mA	
	I _{DD1} (10M)		4.46	5.55	mA	All Input with 10Mbps,

	I _{DD2} (10M)		4.23	5.21	mA	C _L =15pF
	I _{DD1} (100M)		9.91	12.43	mA	All Input with 100Mbps,
	I _{DD2} (100M)		14.68	18.39	mA	C _L = 15pF

6.3. Supply Current Characteristics –3.3V Supply

(VDD1=3.3V± 10%, VDD2=3.3V± 10%, Ta=-40°C to 125°C. Unless otherwise noted, Typical values are at VDD1 = 3.3V, VDD2 = 3.3V, Ta = 25°C)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Supply current	NSI8340					
	I _{DD1} (Q0)		1.19	1.68	mA	All Input 0V for NSI8340x0 Or All Input at supply for NSI8340x1
	I _{DD2} (Q0)		3.93	5.00	mA	
	I _{DD1} (Q1)		5.84	7.30	mA	All Input at supply for NSI8340x0 Or All Input 0V for NSI8340x1
	I _{DD2} (Q1)		3.94	5.04	mA	
	I _{DD1} (1M)		3.58	4.60	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.98	5.12	mA	
	I _{DD1} (10M)		3.82	5.09	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.92	6.27	mA	
	I _{DD1} (100M)		4.94	5.92	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		17.08	20.50	mA	
	NSI8341					
	I _{DD1} (Q0)		1.87	2.51	mA	All Input 0V for NSI8341x0 Or All Input at supply for NSI8341x1
	I _{DD2} (Q0)		3.24	4.17	mA	
	I _{DD1} (Q1)		5.36	6.73	mA	All Input at supply for NSI8341x0 Or All Input 0V for NSI8341x1
	I _{DD2} (Q1)		4.41	5.60	mA	
	I _{DD1} (1M)		3.68	4.73	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.88	4.99	mA	
	I _{DD1} (10M)		4.09	5.38	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.64	5.97	mA	
	I _{DD1} (100M)		7.97	9.56	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		14.04	16.85	mA	
	NSI8342					

Parameters	Symbol	Min	Typ	Max	Unit	Comments
	I _{DD1} (Q0)		2.56	3.34	mA	All Input 0V for NSI8342x0 Or All Input at supply for NSI8342x1
	I _{DD2} (Q0)		2.56	3.34	mA	
	I _{DD1} (Q1)		4.89	6.17	mA	All Input at supply for NSI8342x0 Or All Input 0V for NSI8342x1
	I _{DD2} (Q1)		4.89	6.17	mA	
	I _{DD1} (1M)		3.78	4.86	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.78	4.86	mA	
	I _{DD1} (10M)		4.37	5.68	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.37	5.68	mA	
	I _{DD1} (100M)		11.00	13.21	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		11.00	13.21	mA	

Parameters	Symbol	Min	Typ.	Max	Unit	Comments
Supply current	NSI8330					
	I _{DD1} (Q0)		1.18	1.68	mA	All Input 0V for NSI8330x0 Or All Input at supply for NSI8330x1
	I _{DD2} (Q0)		3.87	4.95	mA	
	I _{DD1} (Q1)		4.67	5.88	mA	All Input at supply for NSI8330x0 Or All Input 0V for NSI8330x1
	I _{DD2} (Q1)		3.94	4.98	mA	
	I _{DD1} (1M)		2.98	3.86	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.91	5.04	mA	
	I _{DD1} (10M)		3.15	4.22	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.61	5.90	mA	
	I _{DD1} (100M)		3.99	4.85	mA	All Input with 100Mbps, C _L =15pF
	I _{DD2} (100M)		13.73	16.58	mA	
	NSI8331					
	I _{DD1} (Q0)		2.56	3.29	mA	All Input 0V for NSI8331x0 Or All Input at supply for NSI8331x1
	I _{DD2} (Q0)		2.56	3.33	mA	
	I _{DD1} (Q1)		4.83	6.11	mA	All Input at supply for NSI8331x0 Or All Input 0V for NSI8331x1
	I _{DD2} (Q1)		3.72	4.75	mA	
	I _{DD1} (1M)		3.71	4.78	mA	All Input with 1Mbps,

Parameters	Symbol	Min	Typ.	Max	Unit	Comments
	I _{DD2} (1M)		3.18	4.12	mA	C _L =15pF
	I _{DD1} (10M)		4.06	5.31	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		3.70	4.81	mA	
	I _{DD1} (100M)		7.66	9.29	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		10.06	12.14	mA	

6.4. Supply Current Characteristics–2.5V Supply

(VDD1=2.5V± 10%, VDD2=2.5V± 10%, Ta=-40°C to 125°C. Unless otherwise noted, Typical values are at VDD1 = 2.5V, VDD2 = 2.5V, Ta = 25°C)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Supply current	NSI8340					
	I _{DD1} (Q0)		1.17	1.64	mA	All Input 0V for NSI8340x0 Or All Input at supply for NSI8340x1
	I _{DD2} (Q0)		3.71	4.82	mA	
	I _{DD1} (Q1)		5.74	6.87	mA	All Input at supply for NSI8340x0 Or All Input 0V for NSI8340x1
	I _{DD2} (Q1)		3.86	5.03	mA	
	I _{DD1} (1M)		3.50	4.21	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.86	5.13	mA	
	I _{DD1} (10M)		3.68	4.88	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.56	5.82	mA	
	I _{DD1} (100M)		4.66	5.63	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		13.58	16.29	mA	
	NSI8341					
	I _{DD1} (Q0)		1.80	2.43	mA	All Input 0V for NSI8341x0 Or All Input at supply for NSI8341x1
	I _{DD2} (Q0)		3.07	4.02	mA	
	I _{DD1} (Q1)		5.27	6.41	mA	All Input at supply for NSI8341x0 Or All Input 0V for NSI8341x1
	I _{DD2} (Q1)		4.33	5.49	mA	
	I _{DD1} (1M)		3.59	4.44	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.77	4.90	mA	
	I _{DD1} (10M)		3.90	5.11	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.34	5.58	mA	

Parameters	Symbol	Min	Typ	Max	Unit	Comments
	I _{DD1} (100M)		6.89	8.29	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		11.35	13.62	mA	
	NSI8342					
	I _{DD1} (Q0)		2.44	3.23	mA	All Input 0V for NSI8342x0 Or All Input at supply for NSI8342x1
	I _{DD2} (Q0)		2.44	3.23	mA	
	I _{DD1} (Q1)		4.80	5.95	mA	All Input at supply for NSI8342x0 Or All Input 0V for NSI8342x1
	I _{DD2} (Q1)		4.80	5.95	mA	
	I _{DD1} (1M)		3.68	4.67	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.68	4.67	mA	
	I _{DD1} (10M)		4.12	5.35	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.12	5.35	mA	
	I _{DD1} (100M)		9.12	10.96	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		9.12	10.96	mA	

Parameters	Symbol	Min	Typ.	Max	Unit	Comments
Supply current	NSI8330					
	I _{DD1} (Q0)		1.17	1.64	mA	All Input 0V for NSI8330x0 Or All Input at supply for NSI8330x1
	I _{DD2} (Q0)		3.71	4.82	mA	
	I _{DD1} (Q1)		4.60	5.56	mA	All Input at supply for NSI8330x0 Or All Input 0V for NSI8330x1
	I _{DD2} (Q1)		3.82	4.98	mA	
	I _{DD1} (1M)		2.92	3.57	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.82	5.05	mA	
	I _{DD1} (10M)		3.05	4.07	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		4.35	5.57	mA	
	I _{DD1} (100M)		3.79	4.63	mA	All Input with 100Mbps, C _L =15pF
	I _{DD2} (100M)		11.11	13.42	mA	
	NSI8331					
	I _{DD1} (Q0)		2.44	3.23	mA	All Input 0V for NSI8331x0 Or All Input at supply for NSI8331x1
	I _{DD2} (Q0)		2.44	3.23	mA	
	I _{DD1} (Q1)		4.76	5.90	mA	

<i>Parameters</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ.</i>	<i>Max</i>	<i>Unit</i>	<i>Comments</i>
	I _{DD2} (Q1)		3.66	4.64	mA	All Input at supply for NSI8331x0 Or All Input 0V for NSI8331x1
	I _{DD1} (1M)		3.64	4.59	mA	All Input with 1Mbps, C _L =15pF
	I _{DD2} (1M)		3.10	4.03	mA	
	I _{DD1} (10M)		3.91	5.10	mA	All Input with 10Mbps, C _L =15pF
	I _{DD2} (10M)		3.49	4.54	mA	
	I _{DD1} (100M)		6.65	8.09	mA	All Input with 100Mbps, C _L = 15pF
	I _{DD2} (100M)		8.25	9.96	mA	

6.5. Switching Characteristics - 5V Supply

(VDD1=5V± 10%, VDD2=5V± 10%, Ta=-40°C to 125°C. Unless otherwise noted, Typical values are at **VDD1 = 5V, VDD2 = 5V, Ta = 25°C**)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Data Rate	DR	0		100	Mbps	
Minimum Pulse Width	PW			8.3	ns	
Propagation Delay	t _{PLH}		12.0	18	ns	See Figure 6.13 , C _L = 15pF
	t _{PHL}		12.5	18	ns	See Figure 6.13 , C _L = 15pF
Pulse Width Distortion t _{PHL} - t _{PLH}	PWD			5.0	ns	See Figure 6.13 , C _L = 15pF
Rising Time	t _r			5.0	ns	See Figure 6.13 , C _L = 15pF
Falling Time	t _f			5.0	ns	See Figure 6.13 , C _L = 15pF
Peak Eye Diagram Jitter	t _{JIT(PK)}		2.5		ns	
Channel-to-Channel Delay Skew	t _{SK(c2c)}			2.5	ns	
Part-to-Part Delay Skew	t _{SK(p2p)}			5.0	ns	
Disable high to Tri-State	t _{PHZ}		8.67	30	ns	See Figure 6.14 , C _L = 15pF, R _L =1k
Enable to Data high Valid	t _{PZH}		8.75	30	ns	See Figure 6.14 , C _L = 15pF, R _L =1k
Disable low to Tri-State	t _{PLZ}		7.7	30	ns	See Figure 6.14 , C _L = 15pF, R _L =1k
Enable to Data low Valid	t _{PZL}		9.5	30	ns	See Figure 6.14 , C _L = 15pF, R _L =1k

6.6. Switching Characteristics - 3.3V Supply

(VDD1=3.3V± 10%, VDD2=3.3V± 10%, Ta=-40°C to 125°C. Unless otherwise noted, Typical values are at **VDD1 = 3.3V, VDD2 = 3.3V, Ta = 25°C**)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Data Rate	DR	0		100	Mbps	
Minimum Pulse Width	PW			8.3	ns	
Propagation Delay	t _{PLH}		12.85	19	ns	See Figure 6.13 , C _L = 15pF
	t _{PHL}		12.60	19	ns	See Figure 6.13 , C _L = 15pF
Pulse Width Distortion t _{PHL} - t _{PLH}	PWD			5.0	ns	See Figure 6.13 , C _L = 15pF

Rising Time	t_r			5.0	ns	See Figure 6.13 , $C_L = 15\text{pF}$
Falling Time	t_f			5.0	ns	See Figure 6.13 , $C_L = 15\text{pF}$
Peak Eye Diagram Jitter	$t_{JIT(PK)}$		2.5		ns	
Channel-to-Channel Delay Skew	$t_{SK(c2c)}$			2.5	ns	
Part-to-Part Delay Skew	$t_{SK(p2p)}$			5.0	ns	
Disable high to Tri-State	t_{PHZ}		11	30	ns	See Figure 6.14 , $C_L = 15\text{pF}$, $R_L=1\text{k}$
Enable to Data high Valid	t_{PZH}		11.5	30	ns	See Figure 6.14 , $C_L = 15\text{pF}$, $R_L=1\text{k}$
Disable low to Tri-State	t_{PLZ}		9.3	30	ns	See Figure 6.14 , $C_L = 15\text{pF}$, $R_L=1\text{k}$
Enable to Data low Valid	t_{PZL}		12.3	30	ns	See Figure 6.14 , $C_L = 15\text{pF}$, $R_L=1\text{k}$

6.7. Switching Characteristics - 2.5V Supply

(VDD1=2.5V± 10%, VDD2=2.5V± 10%, Ta=-40°C to 125°C. Unless otherwise noted, Typical values are at **VDD1 = 2.5V**, **VDD2 = 2.5V**, Ta = 25°C)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Data Rate	DR	0		100	Mbps	
Minimum Pulse Width	PW			8.3	ns	
Propagation Delay	t_{PLH}		13.97	20	ns	See Figure 6.13 , $C_L = 15\text{pF}$
	t_{PHL}		12.72	20	ns	See Figure 6.13 , $C_L = 15\text{pF}$
Pulse Width Distortion $ t_{PHL} - t_{PLH} $	PWD			5.0	ns	See Figure 6.13 , $C_L = 15\text{pF}$
Rising Time	t_r			5.0	ns	See Figure 6.13 , $C_L = 15\text{pF}$
Falling Time	t_f			5.0	ns	See Figure 6.13 , $C_L = 15\text{pF}$
Peak Eye Diagram Jitter	$t_{JIT(PK)}$		2.5		ns	
Channel-to-Channel Delay Skew	$t_{SK(c2c)}$			2.5	ns	
Part-to-Part Delay Skew	$t_{SK(p2p)}$			5.0	ns	
Disable high to Tri-State	t_{PHZ}		13.9	30	ns	See Figure 6.14 , $C_L = 15\text{pF}$, $R_L=1\text{k}$
Enable to Data high Valid	t_{PZH}		15.6	30	ns	See Figure 6.14 , $C_L = 15\text{pF}$, $R_L=1\text{k}$
Disable low to Tri-State	t_{PLZ}		12.6	30	ns	See Figure 6.14 , $C_L = 15\text{pF}$, $R_L=1\text{k}$

Enable to Data low Valid	t_{PZL}	16.8	30	ns	See Figure 6.14 , $C_L = 15pF$, $R_L=1k$
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6.8. Typical Performance Characteristics

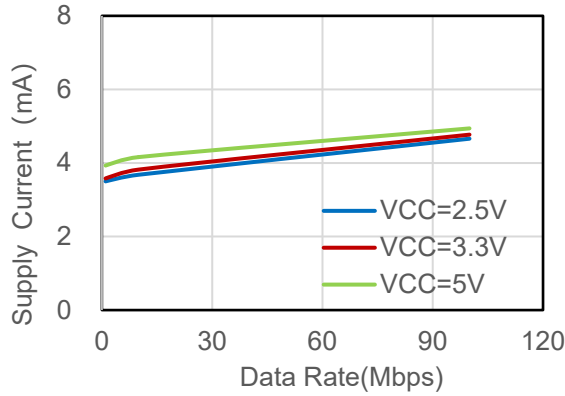


Figure 6.1 NSI8340 VDD1 Supply Current vs Data Rate

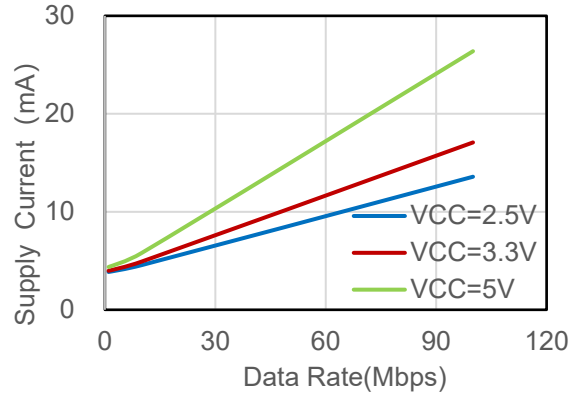


Figure 6.2 NSI8340 VDD2 Supply Current vs Data Rate

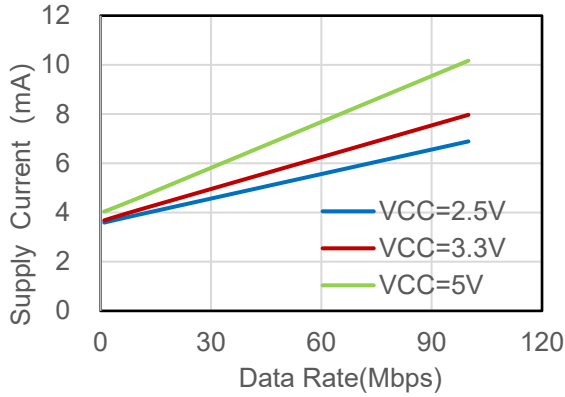


Figure 6.3 NSI8341 VDD1 Supply Current vs Data Rate

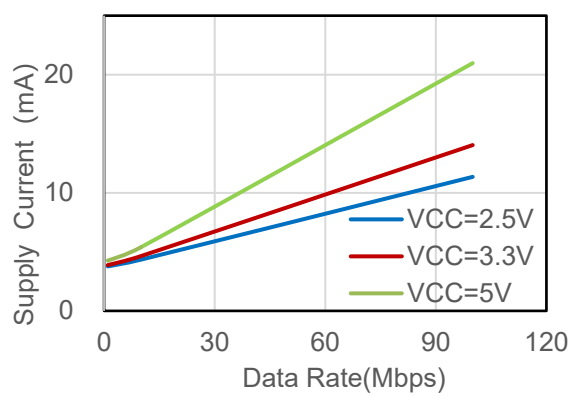


Figure 6.4 NSI8341 VDD2 Supply Current vs Data Rate

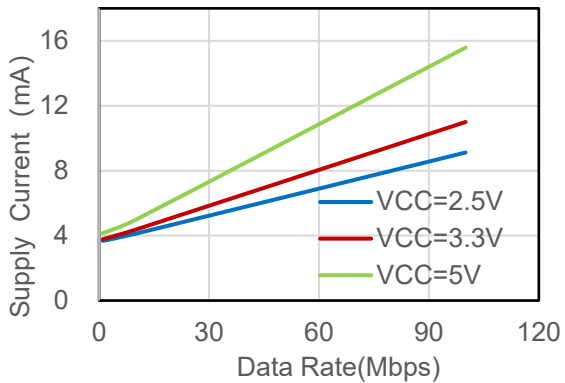


Figure 6.5 NSI8342 VDD1 Supply Current vs Data Rate

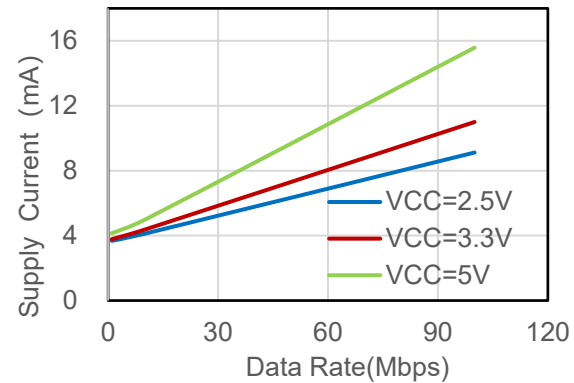


Figure 6.6 NSI8342 VDD2 Supply Current vs Data Rate

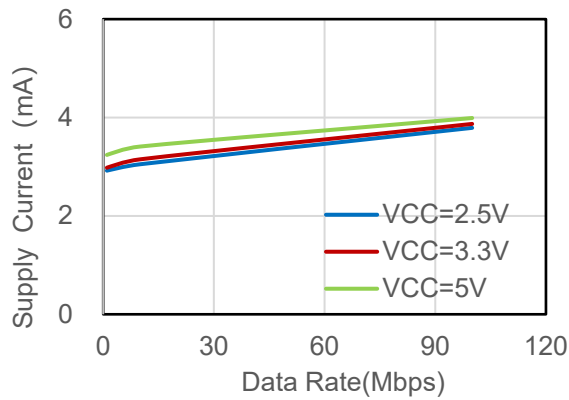


Figure 6.7 NSI8330 VDD1 Supply Current vs Data Rate

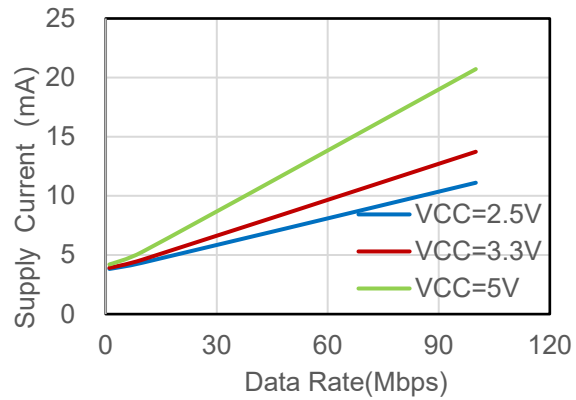


Figure 6.8 NSI8330 VDD2 Supply Current vs Data Rate

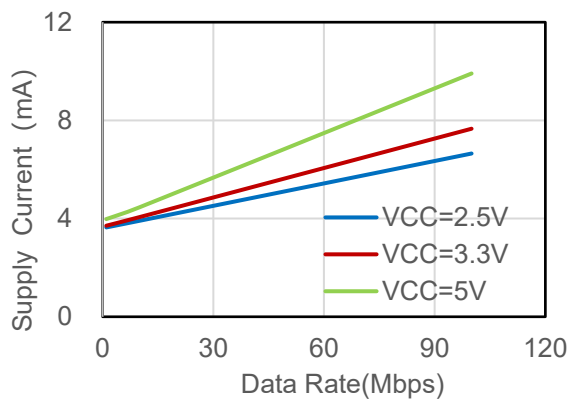


Figure 6.9 NSI8331 VDD1 Supply Current vs Data Rate

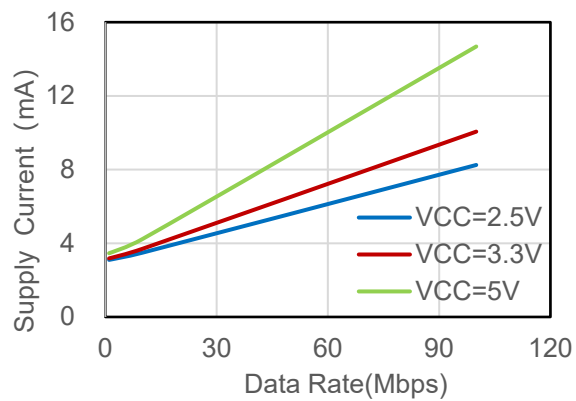


Figure 6.10 NSI8331 VDD2 Supply Current vs Data Rate

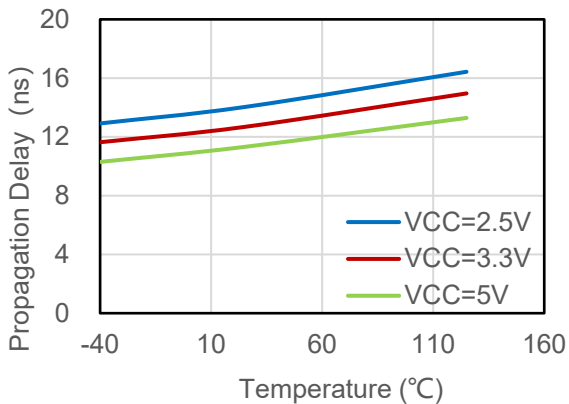


Figure 6.11 Rising Edge Propagation Delay Vs Temp

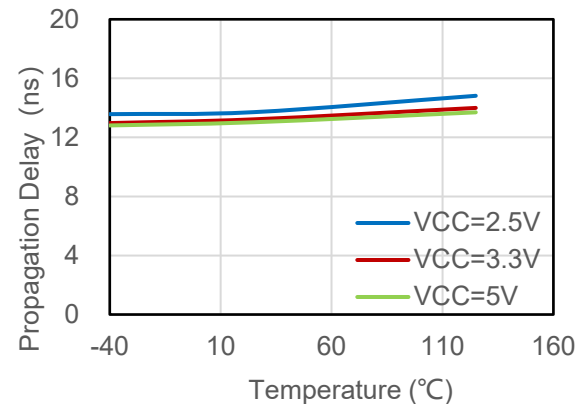
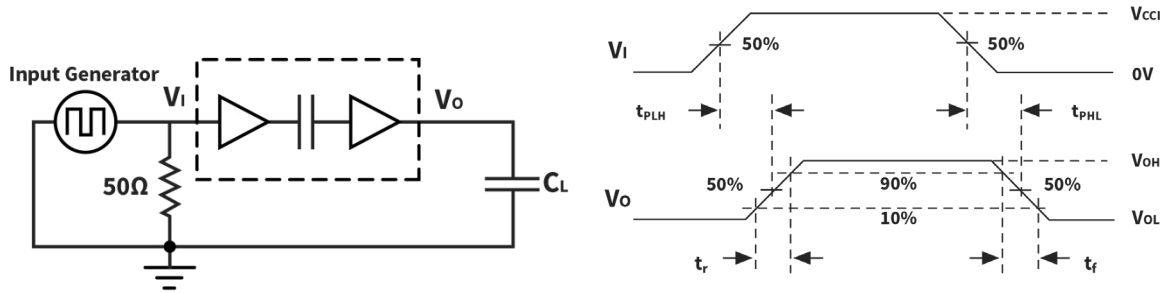


Figure 6.12 Falling Edge Propagation Delay Vs Temp

6.9. Parameter Measurement Information



(1) Input Generator Characteristics : PRR $\leq$ 50kHz, $t_r \leq$ 3ns, $t_f \leq$ 3ns, Duty cycle = 50%, $Z_o = 50 \Omega$.

Figure 6.13 Switching Characteristics Test Circuit and Waveform

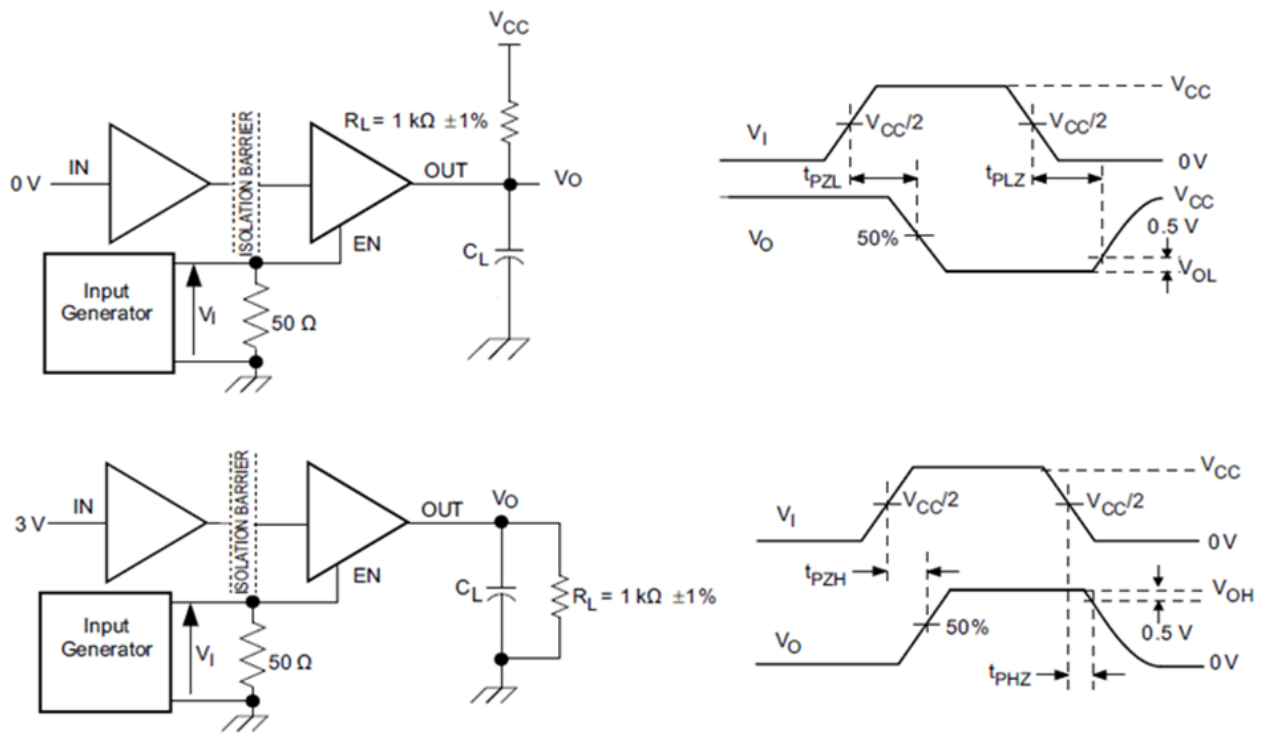


Figure 6.14 Enable/Disable Propagation Delay Time Test Circuit and Waveform

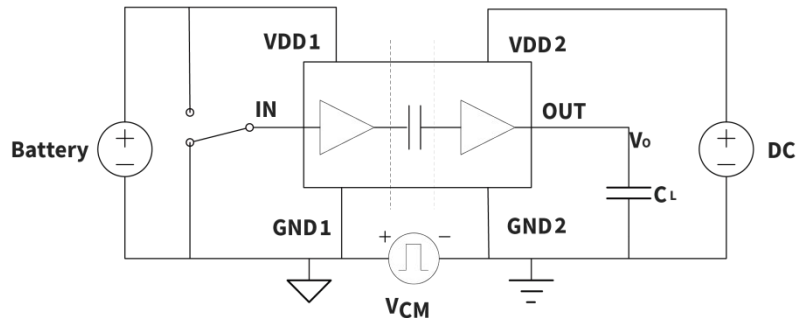


Figure 6.15 Common-Mode Transient Immunity Test Circuit

7. High Voltage Feature Description

7.1. Insulation and Safety Related Specifications

<i>Parameters</i>	<i>Symbol</i>	<i>Value</i> SSOW16	<i>Unit</i>	<i>Comments</i>
Minimum External Clearance	CLR	8.2	mm	IEC 60664-1
Minimum External Creepage	CPG	8.2	mm	IEC 60664-1
Distance Through Insulation	DTI	24	µm	Distance through insulation
Tracking Resistance (Comparative Tracking Index)	CTI	>600	V	DIN EN 60112 (VDE 0303-11); IEC 60112
Material Group		I		IEC 60664-1

<i>Description</i>	<i>Test Condition</i>	<i>Value</i> SSOW16
Overvoltage Category per IEC60664-1	For Rated Mains Voltage $\leq$ 150Vrms	I to IV
	For Rated Mains Voltage $\leq$ 300Vrms	I to IV
	For Rated Mains Voltage $\leq$ 600Vrms	I to IV
	For Rated Mains Voltage $\leq$ 1000Vrms	I to III
Climatic Classification		40/125/21
Pollution Degree per DIN VDE 0110		2

7.2. Insulation Characteristics

<i>Description</i>	<i>Test Condition</i>	<i>Symbol</i>	<i>Value</i> SSOW16	<i>Unit</i>
Maximum repetitive isolation voltage		V_{IORM}	2121	V_{PEAK}
Maximum working isolation voltage	AC Voltage	V_{IOWM}	1500	V_{RMS}
	DC Voltage		2121	V_{DC}
Apparent Charge	Method a, after Input/output safety test subgroup 2/3,			pC

Description	Test Condition	Symbol	Value	
			SSOW16	Unit
	$V_{ini}=V_{IOTM}$, $t_{ini} = 60\text{ s}$, $V_{pd(m)}=1.2*V_{IORM}$, $t_m=10\text{s}$.	q_{pd}	<5	
	Method a, after environmental tests subgroup 1, $V_{ini}=V_{IOTM}$, $t_{ini}=60\text{s}$, $V_{pd(m)}=1.6*V_{IORM}$, $t_m=10\text{s}$			pC
	Method b, routine test (100% production) and preconditioning (type test); $V_{ini}=1.2*V_{IOTM}$, $t_{ini}=1\text{s}$ $V_{pd(m)}=1.875*V_{IORM}$, $t_m=1\text{s}$ (method b1) or $V_{pd(m)}=V_{ini}$, $t_m=t_{ini}$ (method b2)			pC
Apparent Charge	Method a, after Input/output safety test subgroup 2/3, $V_{ini}=V_{IOTM}$, $t_{ini} = 60\text{ s}$, $V_{pd(m)}=1.2*V_{IORM}$, $t_m=10\text{s}$.	q_{pd}	\	pC
	Method a, after environmental tests subgroup 1, $V_{ini}=V_{IOTM}$, $t_{ini}=60\text{s}$, $V_{pd(m)}=1.3*V_{IORM}$, $t_m=10\text{s}$			pC
	Method b, routine test (100% production) and preconditioning (type test); $V_{ini}=1.2*V_{IOTM}$, $t_{ini}=1\text{s}$ $V_{pd(m)}=1.5*V_{IORM}$, $t_m=1\text{s}$ (method b1) or $V_{pd(m)}=V_{ini}$, $t_m=t_{ini}$ (method b2)			pC
Maximum transient isolation voltage	$t = 60\text{ sec}$	V_{IOTM}	8000	V_{PEAK}
Maximum impulse voltage	Tested in air, 1.2/50-us waveform per IEC62368-1	V_{IMP}	6250	V_{PEAK}
Maximum Surge Isolation Voltage	Test method per IEC62368-1, 1.2/50us waveform, $V_{IOSM} \geq V_{IMP} \times 1.3$	V_{IOSM}	10000	V_{PEAK}
Isolation resistance	$V_{IO} = 500\text{V}$, $T_{amb}=25^\circ\text{C}$	R_{IO}	$>10^{12}$	Ω

Description	Test Condition	Symbol	Value	
			SSOW16	Unit
	$V_{IO} = 500V, 100^{\circ}C \leq T_{amb} \leq 125^{\circ}C$	R_{IO}	$>10^{11}$	Ω
	$V_{IO} = 500V, T_{amb} = T_s$	R_{IO}	$>10^9$	Ω
Isolation capacitance	$f = 1MHz$	C_{IO}	0.8	pF
Insulation voltage per UL	$V_{TEST} = V_{ISO}, t = 60 s$ (qualification), $V_{TEST} = 1.2 \times V_{ISO}, t = 1 s$ (100% production test)	V_{ISO}	5000	V_{RMS}

7.3. Safety-Limiting Values

Reinforced isolation safety-limiting values as outlined in VDE-0884-17 of NSI83xWx-DSSWR.

Description	Test Condition	Value	Unit
Safety Supply Power	$R_{\theta JA} = 78.9^{\circ}C/W^1), T_J = 150^{\circ}C, T_A = 25^{\circ}C$	1584	mW
Safety Supply Current	$R_{\theta JA} = 78.9^{\circ}C/W^1), V_I = 5V, T_J = 150^{\circ}C, T_A = 25^{\circ}C$	316.8	mA
Safety Temperature ²⁾		150	$^{\circ}C$

- 1) Calculate with the junction-to-air thermal resistance, $R_{\theta JA}$, of SSOW16 package ([Thermal Information Table](#)) which is that of a device installed on a low effective thermal conductivity test board (1s) according to JESD51-3.
- 2) The maximum safety temperature has the same value as the maximum junction temperature (T_J) specified for the device.

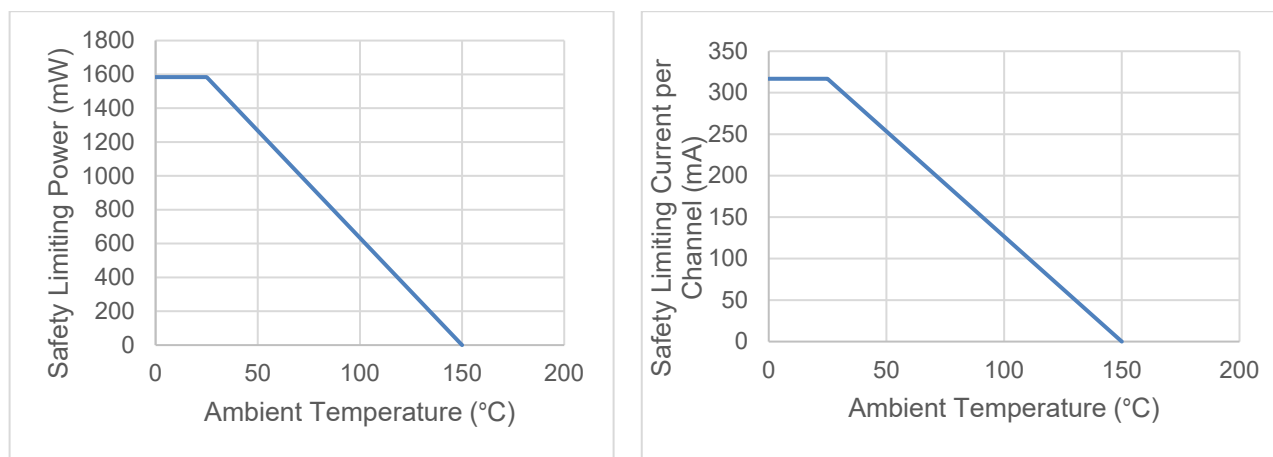


Figure 7.1 NSI83x Thermal derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN EN IEC 60747-17 (VDE 0884-17).

7.4. Regulatory Information

The NSI83xWx-DSSWR are approved by the organizations listed in table.

UL	CQC	TUV
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UL 1577 Component Recognition Program	Approved under CSA Component Acceptance Notice 5A	Certified according to GB4943.1-2022	DIN EN IEC 60747-17 (VDE 0884-17)	Certified According to EN IEC 62368-1
Single Protection, 5000V _{rms} Isolation voltage	Single Protection, 5000V _{rms} Isolation voltage	Reinforced insulation	Reinforced Insulation V _{IORM} =2121V _{peak} V _{IOTM} =8000V _{peak} V _{IOSM} =10000V _{peak}	5000V _{rms} for 1min
Pending	Pending	Pending	Pending	Pending

8. Function Description

8.1. Overview

The NSI83x is a triple or quad-channel digital isolator based on a capacitive isolation barrier technique. The digital signal is modulated with RF carrier generated by the internal oscillator at the Transmitter side. Then it is transferred through the capacitive isolation barrier and demodulated at the receiver side.

The NSI83x devices are high reliability triple or quad-channel digital isolator. The NSI83x device is safety certified by UL1577 and supports 5kV_{rms} insulation withstand voltages, while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of the NSI83x is up to 100Mbps, and the common-mode transient immunity (CMTI) is up to 200kV/us. The NSI83x device provides digital channel direction configuration and the default output level configuration when the input power is lost. Wide supply voltage of the NSI83x device supports connection to most digital interfaces directly, making level shifting easy. High system level EMC performance enhances reliability and stability of use.

The NSI83x has a default output status when VDD_{IN} is unready and VDD_{OUT} is ready as shown in Table 8.1, which helps with diagnosis when power is missing at the transmitter side. The output B follows the same status with the input A after powering up.

Table 8.1 Output status vs. power status

Input ¹	EN _x ²	VDD _{IN} status	VDD _{OUT} status	Output	Comment
H	H or NC	Ready	Ready	H	Normal operation.
L	H or NC	Ready	Ready	L	
X	L	Ready	Ready	Z	Output Disabled, the output is high impedance (Internal pull up to VDD _{OUT} with NSI83xxx1 or internal pull down to GND with NSI83xxx0)
X	H or NC	Unready	Ready	L(NSI83xx0) H(NSI83xx1)	The output follows the same status with the input after input side VDD _{IN} is powered on.
X	L	Unready	Ready	Z	Output Disabled, the output is high impedance (Internal pull up to VDD _{OUT} with NSI83xxx1 or internal pull down to GND with NSI83xxx0)
X	X	Ready	Unready	Undetermined	The output follows the same status with the input after output side VDD _{OUT} is powered on.
Note: H=Logic high; L=Logic low; X=Logic low or logic high VDD_{IN} is input side power; VDD_{OUT} is output side power. (1) There is a protection diode between the input and the VDD_{IN}. When the VDD_{IN} is floating, the strong drive signal through the input pin will put the VDD_{IN} in an indeterminate state. (2) The EN_x is output side enable.					

8.2. OOK Modulation

NSI83x is based on a capacitive isolation barrier technique and the digital signal is modulated with RF carrier generated by the internal oscillator at the transmitter side, as shown in Figure 8.1 to Figure 8.2, then it is transferred through the capacitive isolation barrier and demodulated at the receiver side. The modulation uses OOK modulation technique with key benefits of high noise immunity and low radiation EMI.

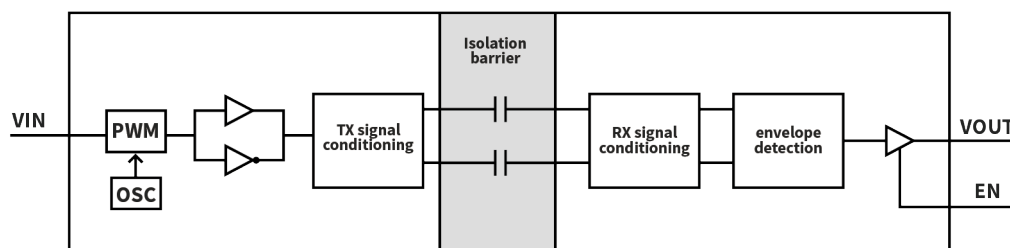


Figure 8.1 Single Channel Function Block Diagram

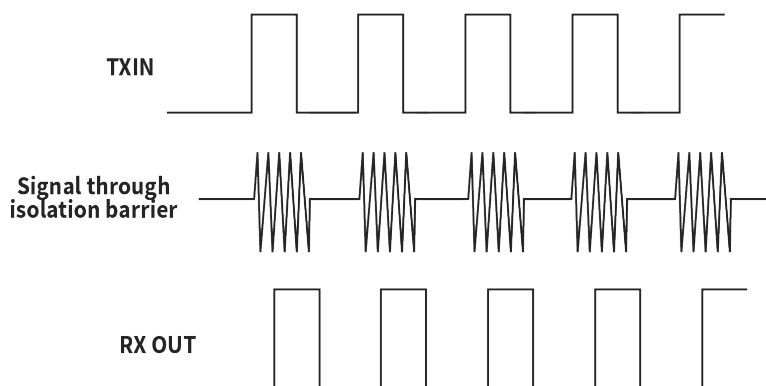


Figure 8.2 OOK Modulation

9. Application Note

9.1. Typical Application Circuit

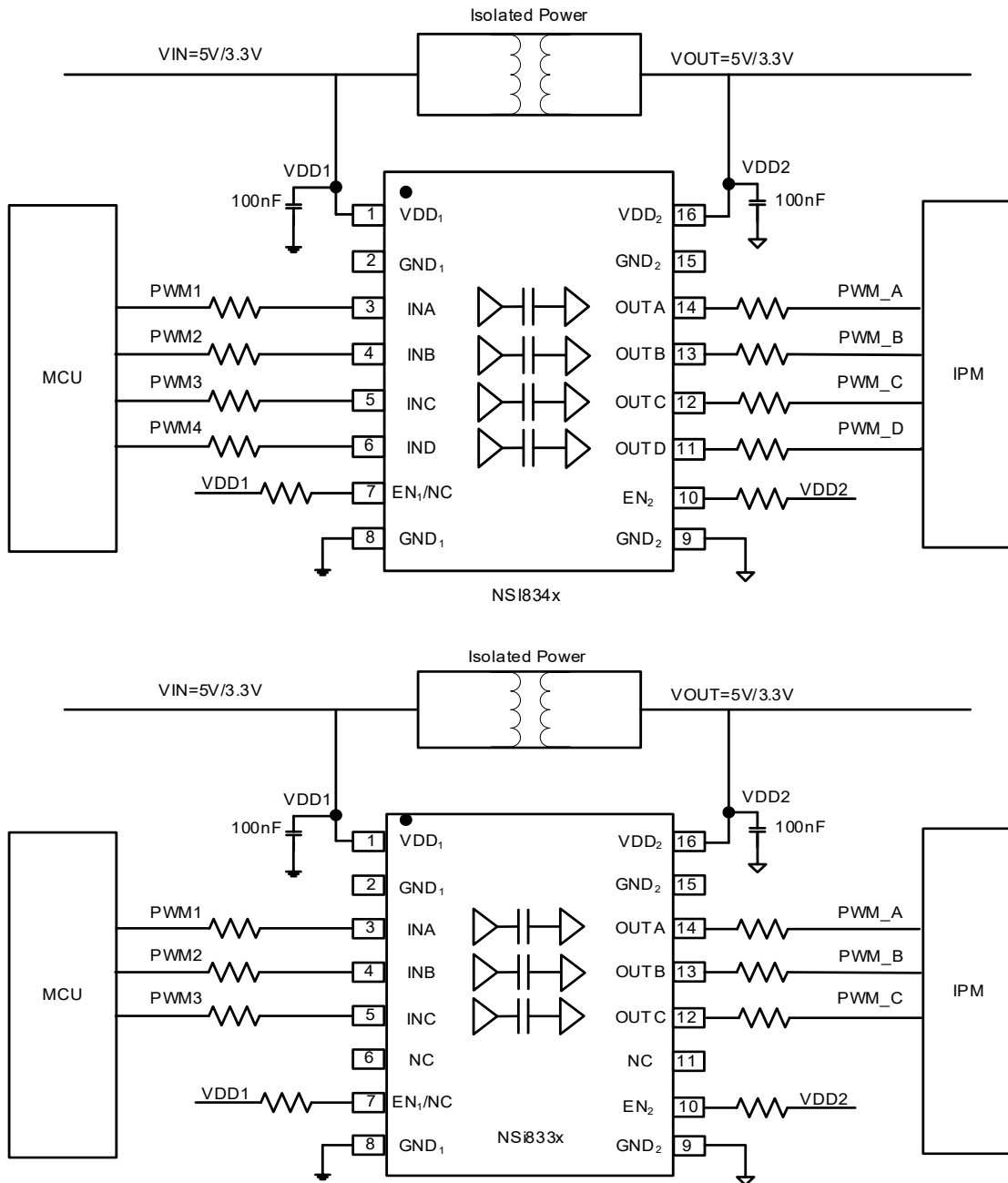


Figure 9.1 Typical PWM isolation circuit for IPM

9.2. PCB Layout

The NSI83x requires a 0.1 μ F bypass capacitor between VDD1 and GND1, VDD2 and GND2. The capacitor should be placed as close as possible to the package. It is recommended to make sure the space under the chip should keep free from planes, traces, pads and via. To enhance the robustness of a design, the user may also include resistors (50–300 Ω) in series with the inputs and outputs if the system is excessively noisy. The series resistors also improve the system reliability such as latch-up immunity.

The typical output impedance of an isolator driver channel is approximately $50\ \Omega$, $\pm 40\%$. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.

9.3. High Speed Performance

Figure 9.2 shows the eye diagram of NSI83x at 50Mbps data rate output. The result shows a typical measurement on NSI83x with low jitter and wide open eye characteristics.

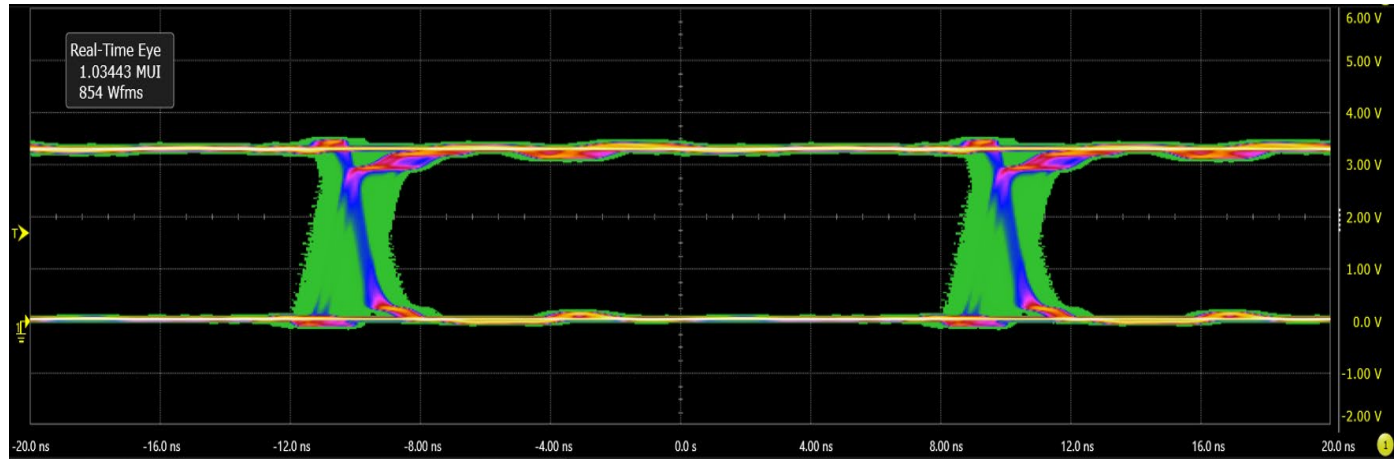


Figure9.2 Eye Diagram at 50Mbps PRBS $2^{16}-1$, 2.5V and 25°C

9.4. Typical Supply Current Equations

The typical supply current of NSI834x and NSI833x can be calculated using below equations. I_{DD1} and I_{DD2} are typical supply currents measured in mA, f is data rate measured in Mbps, C_L is the capacitive load measured in pF.

NSI8340:

$$I_{DD1} = 0.298 \cdot a1 + 1.458 \cdot b1 + 0.878 \cdot c1.$$

$$I_{DD2} = 3.93 + 0.5 \cdot VDD2 \cdot f \cdot C_L \cdot c1 \cdot 10^{-3}$$

When $a1$ is the channel number of default state input at side 1, $b1$ is the channel number of non-default state input at side 1, $c1$ is the channel number of switch signal input at side 1.

NSI8341:

$$I_{DD1} = 1.875 + 1.16 \cdot b1 + 0.58 \cdot c1 + 0.5 \cdot VDD1 \cdot f \cdot C_L \cdot c2 \cdot 10^{-3}$$

$$I_{DD2} = 3.245 + 1.16 \cdot b2 + 0.58 \cdot c2 + 0.5 \cdot VDD2 \cdot f \cdot C_L \cdot c1 \cdot 10^{-3}$$

When $b1$ is the channel number of non-default state input at side 1, $c1$ is the channel number of switch signal input at side 1, $b2$ is the channel number of non-default state input at side 2, $c2$ is the channel number of switch signal input at side 2.

NSI8342:

$$I_{DD1} = 2.56 + 1.16 \cdot b1 + 0.58 \cdot c1 + 0.5 \cdot VDD1 \cdot f \cdot C_L \cdot c2 \cdot 10^{-3}$$

$$I_{DD2} = 2.56 + 1.16 \cdot b2 + 0.58 \cdot c2 + 0.5 \cdot VDD2 \cdot f \cdot C_L \cdot c1 \cdot 10^{-3}$$

NSI8330:

$$I_{DD1} = 0.298 \cdot a1 + 1.458 \cdot b1 + 0.878 \cdot c1.$$

$$I_{DD2} = 3.93 + 0.5 \cdot VDD2 \cdot f \cdot C_L \cdot c1 \cdot 10^{-3}$$

When $a1$ is the channel number of low input at side 1, $b1$ is the channel number of high input at side 1, $c1$ is the channel number of switch signal input at side 1.

NSI8331:

$$I_{DD1} = 2.56 + 1.16 \cdot b1 + 0.58 \cdot c1 + 0.5 \cdot VDD1 \cdot f \cdot C_L \cdot c2 \cdot 10^{-3}$$

$$I_{DD2} = 2.56 + 1.16 \cdot b2 + 0.58 \cdot c2 + 0.5 \cdot V_{DD2} \cdot f \cdot C_L \cdot c1 \cdot 10^{-3}$$

When b1 is the channel number of non-default state input at side 1, c1 is the channel number of switch signal input at side 1, b2 is the channel number of non-default state input at side 2, c2 is the channel number of switch signal input at side 2.

10. Package Information

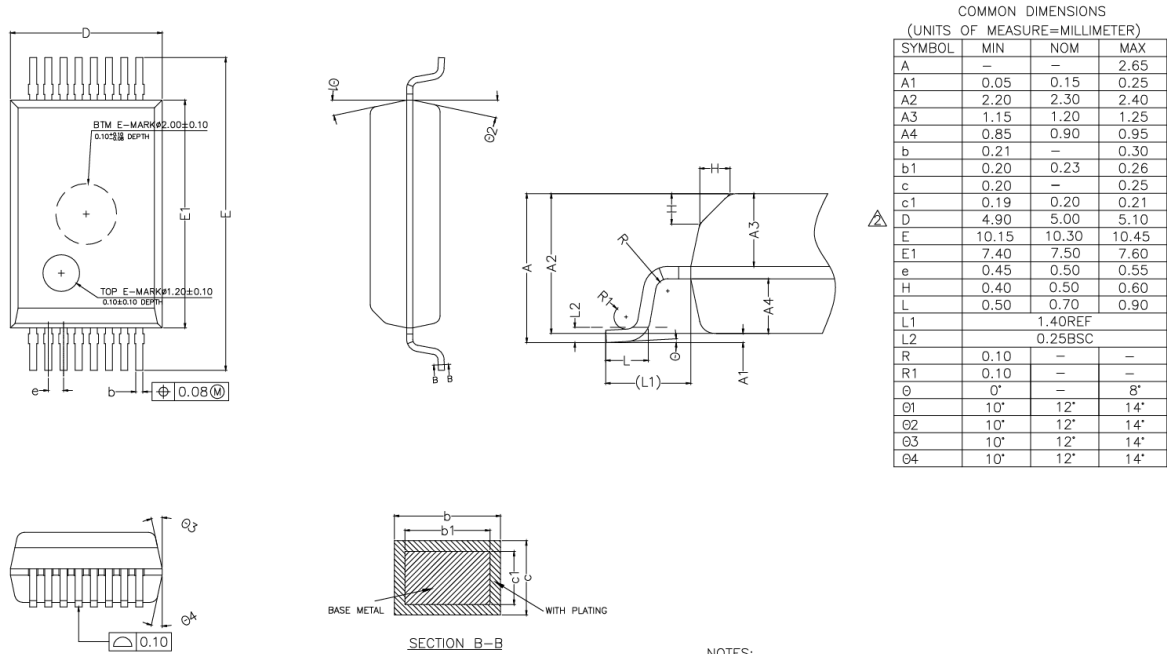


Figure 10.1 SSOW16 Package Shape and Dimension in millimeters

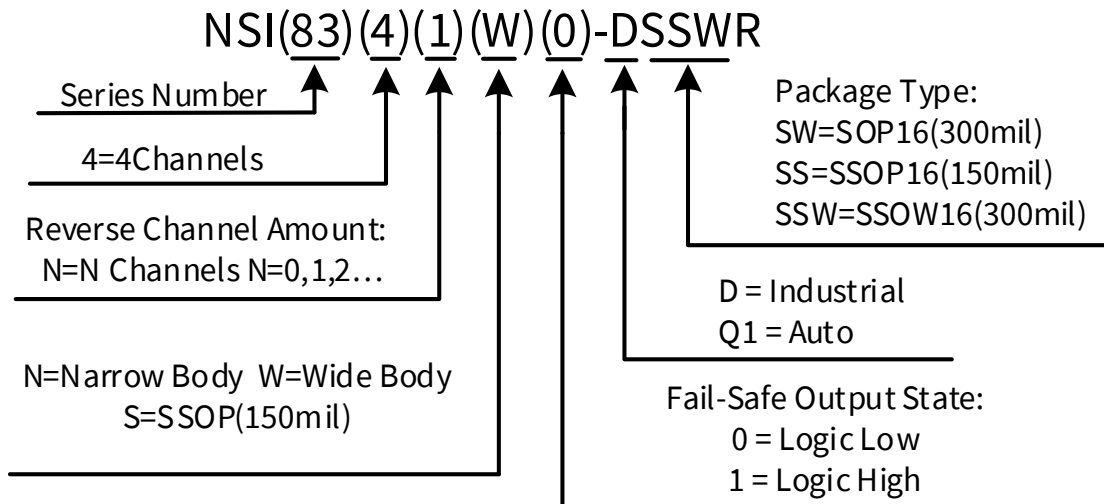
NOTE: This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.

11. Order Information

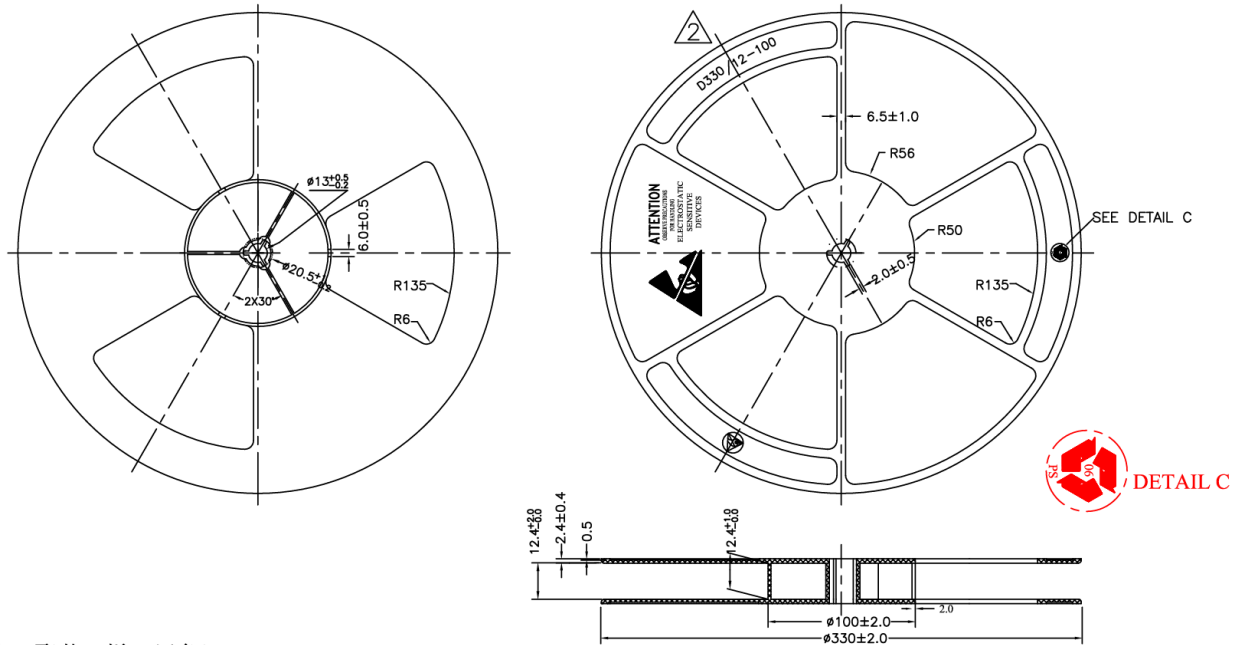
Part Number	Isolation Rating (kV)	Number of side 1 inputs	Number of side 2 inputs	Max Data Rate (Mbps)	Default Output State	Temperature	MSL	Package Type	Package Drawing	SPQ	MPQ
NSI8340W0-DSSWR	5	4	0	100	Low	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8340W1-DSSWR	5	4	0	100	High	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8341W0-DSSWR	5	3	1	100	Low	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8341W1-DSSWR	5	3	1	100	High	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8342W0-DSSWR	5	2	2	100	Low	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8342W1-DSSWR	5	2	2	100	High	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8330W0-DSSWR	5	3	0	100	Low	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8330W1-DSSWR	5	3	0	100	High	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8331W0-DSSWR	5	2	1	100	Low	-40 to 125°C	3	SSOW16	SSOW16	1000	1000
NSI8331W1-DSSWR	5	2	1	100	High	-40 to 125°C	3	SSOW16	SSOW16	1000	1000

NOTE: All packages are RoHS-compliant with peak reflow temperatures of 260 °C according to the JEDEC industry standard classifications and peak solder temperatures.

Part Number Rule:



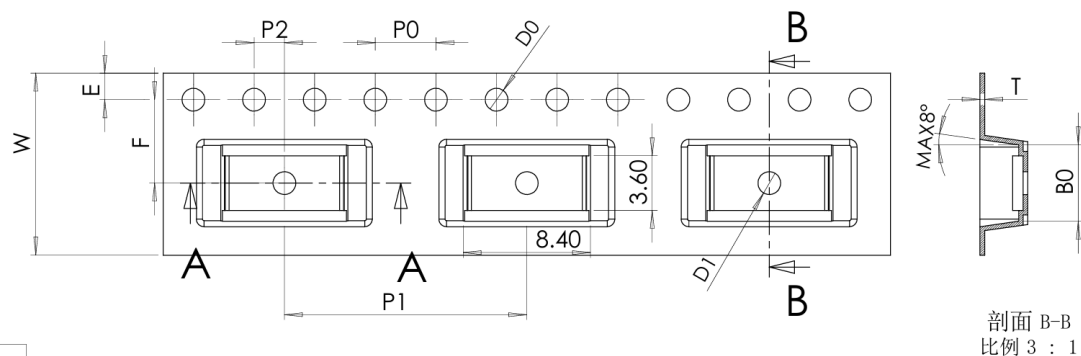
12. Tape and Reel Information



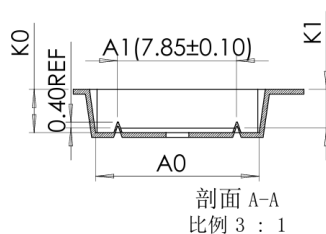
注意：

1. 材料：聚苯乙烯（黑色）；
2. 平整度：最大允许3毫米；
3. 所有尺寸为毫米；
4. 表面电阻： 10^5 TO 10^{11} OHMS/SQ.
5. 所有未注公差： ± 0.25 。

Figure 12.1 Reel Information of SSOW16



Item	Spec
W	12.00±0.30/-0.10
E	1.75±0.10
F	5.50±0.05
P0	4.00±0.10
P1	16.00±0.10
P2	2.00±0.05
D0	1.50±0.10/0
D1	1.50±0.10
A0	10.80±0.10
B0	4.95±0.10
K0	2.85±0.10
K1	2.55±0.10
T	0.30±0.05
Unit	mm



NOTES:

- 10spockets hole pitch cumulative tolerance $\pm 0.2\text{mm}$
- Carrier camber is within 1mm in 250mm
- Material: black conductive PS
- All dims in :mm
- There must not be foreign body adhesion and the state of the surface must be excellent
- Surface resistance $1 \times 10^4 \Omega \leq R < 1 \times 10^{10} \Omega$
- Friction voltage $< 100\text{V}$

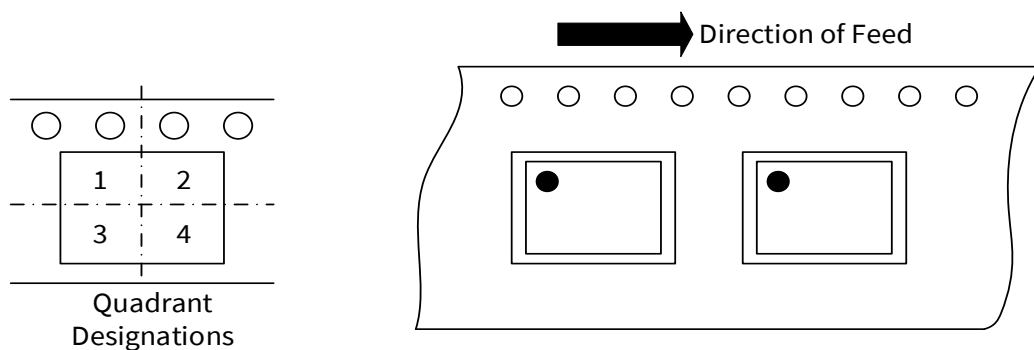


Figure 12.2 Tape Information of SSOW16

13. Revision History

Revision	Description	Date
1.0	Initial version	2026/8/24

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