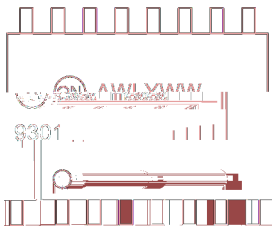
High Speed 3−Channel Digital Isolator

NCID9301, NCID9311

SOIC16 W
CASE 751EN

MARKING DIAGRAM



A	= Assembly Location
WL	= Wafer Lot / Assembly Lot
Y	= Year
WW	= Work Week
9301 / 9311	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 14 of this data sheet.

Description

The NCID9301 and NCID9311 are galvanically isolated high−speed 3−channel digital isolator with output enable. This device supports isolated communications thereby allowing digital signals to communicate between systems without conducting ground loops or hazardous voltages.

It utilizes **onsemi's** patented galvanic off−chip capacitor isolation technology and optimized IC design to achieve high insulation and high noise immunity, characterized by high common mode rejection and power supply rejection specifications. The thick ceramic substrate yields capacitors with ~25 times the thickness of thin film on−chip capacitors and coreless transformers. The result is a combination of the electrical performance benefits that digital isolators offer with the safety reliability of a >0.5 mm insulator barrier similar to what has historically been offered by optocouplers.

The device is housed in a 16

Microprocessor System Interface (SPI, I^2C, etc.)
Programmable Logic Control
Isolated Data Acquisition System
Voltage Level Translator

BLOCK DIAGRAM

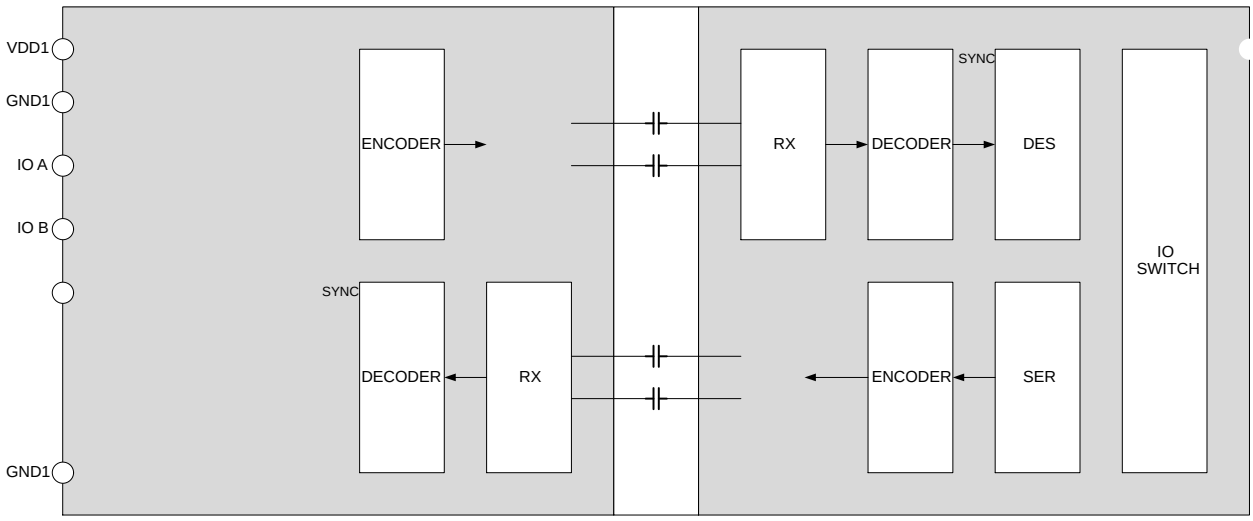


Figure 1. Functional Block Diagram

PIN CONFIGURATION

NCID9301

V_{DD1}	V_{DD2}
GND1	GND2
V_{INA}	V_{OA}
V_{INB}	V_{OB}
V_{INC}	V_{OC}
NC	NC
NC	EN2
GND1	GND2

NCID9311

V_{DD1}	V_{DD2}
GND1	GND2
V_{INA}	V_{OA}
V_{INB}	V_{OB}

Figure 2. Pin and Channel Configuration

SPECIFICATIONS

TRUTH TABLE (Note 1)

V_{INX}	EN_X	V_{DDI}	V_{DDO}	V_{OX}	Comment
H	H/NC	Power Up	Power Up	H	Normal Operation
L	H/NC	Power Up	Power Up	L	Normal Operation
NC	H/NC	Power Up	Power Up	L	Default low
X	L	Power Up	Power Up	Hi−Z	
X	H/NC	Power Down	Power Up	L	Default low; V_{OX} return to normal operation when V_{DDIL}

	Unit
50	C
25	C
50	C
s	C
	V
	V
	mA
	mW

eeded, device functionality

Max	Unit
+125	C
5.5	V
V_{DDI}	V
0.1 V_{DDI}	V
–	V
–	V

ELECTRICAL
Apply over all re
are measured at

Symbol							
V_{OH}							
V_{OL}							
V_{INT+}							
V_{INT-}							
$V_{INT(HYS)}$							
I_{INH}	High Level Input Current	$V_{IH} = V_{DDI}$	–	–	1	μA	
I_{INL}	Low Level Input Current	V_{IL} = 0 V	–1	–	–	μA	
CMTI	Common Mode Transient Immunity	$V_I = V_{DDI}$ or 0 V, V_{CM} = 1500 V	100	150	–	kV/μs	16
C_{IN}							

SWITCHING CHARACTERISTICS – NCID9311

Apply over all recommended conditions, T_A =−40 C to +125 C unless otherwise specified. All typical values are measured at T_A = 25 C.

Symbol	Parameter	Ch	Conditions	Min	Typ	Max	Unit	Figure
t_{PHL}	Propagation Delay to Logic Low Output (Note 8)	A, B	V_{DD} = 5 V, C_L = 15 pF	–	95	140		

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

T_A – Ambient Temperature (°C)

Figure 9. NCID9311 Channel A/B Propagation Delay vs. Ambient Temperature

T_A – Ambient Temperature (°C)

Figure 10. NCID9311 Channel C Propagation Delay vs. Ambient Temperature

I_{OH} – High Level Output Current (mA)

Figure 11. High Level Output Voltage vs. Current

Figure 12. Low Level Output Voltage vs. Current

TEST CIRCUITS

APPLICATION INFORMATION

Theory of Operation

NCID9301 and NCID9311 are 3−channel digital isolators. The chip to chip galvanic isolation are provided by a pair of off−chip capacitors. Digital circuits are used for processing signals through the 0.5 mm thick isolation barrier.

Pins are trimmed internally as input or output at IO Switch. Each direction of communication between two isolated circuits are achieved by implementing a pair of Serializer/Deserializer and Manchester Encoder/Decoder functional blocks as shown in Figure 17. The Serializer circuit converts the parallel data from the IO Switch into a serial (one bit) stream and the Manchester Encoder converts this data stream into coded data making it more robust, efficient and accurate for transmission. After encoding, all inputs signals are coded as $V_I T_X$ and transmitted across the isolation barrier via Transceiver.

The off−chip ceramic capacitors that serve both as the isolation barrier and as the medium of transmission for signal switching using On−Off keying (OOK) technique, illustrated in the transceiver block diagram in Figure 18 and Figure 19. At

Figure 20. 4−

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