NSIP8840/NSIP8841/NSIP8842/NSIP8843/NSIP8844
Quad-Channel Digital Isolators with Integrated DC to DC Converter

Datasheet (EN) 1.2

Product Overview

The NSIP884x devices are quad-channel digital isolators with integrated isolated DC-DC converter. The isolated DC-DC converter provides up to 500mW output power using on chip transformer. The feedback PWM signal is sent to primary side by a digital isolator based on Novosense capacity isolation technology. The high integrated solution can help to simplify system design and improve reliability. The NSIP884x device is safety certified by UL1577 support 5kVrms withstand voltages, while providing high electromagnetic immunity and low emissions. The data rate of the NSIP884x is up to 150Mbps, and the common-mode transient immunity (CMTI) is up to 150kV/us. The NSIP884x devices provide 5V to 5V, 5V to 3.3V, 3.3V to 3.3V conversion mode, the output voltage can be set by SEL pin. The logical level of digital isolators on left side can be set by VDDL pin which can support the application when the supply voltage and I/O voltage level are different.

Key Features

- Up to 5000Vrms Insulation voltage
- Power supply voltage: 3.3V to 5.5V
- 5V to 5V, 5V to 3.3V, support 100mA load current
- 3.3V to 3.3V, support 60mA load current
- Over current and over temperature protection
- Data rate: DC to 150Mbps
- High CMTI: 150kV/us
- Propagation delay: <15ns
- High system level EMC performance:

  Enhanced system level ESD, EFT, Surge immunity
- Operation temperature: -40℃~125℃
- RoHS-compliant packages:

  SOW16

Safety Regulatory Approvals

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

Applications

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

Device Information

Part Number	*Package*	*Body Size*
NSIP884x-DSWR	SOW16	10.30mm × 7.50mm

Functional Block Diagrams

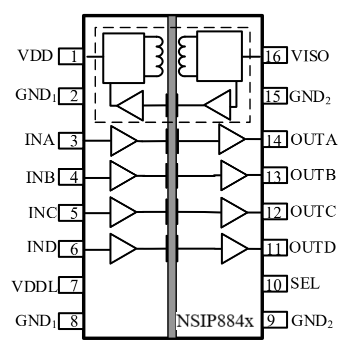

Figure 1. NSIP884x Block Diagram[1]

[1] The isolation channel direction can be either depend on different part number.

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1. Pin Configuration And Functions

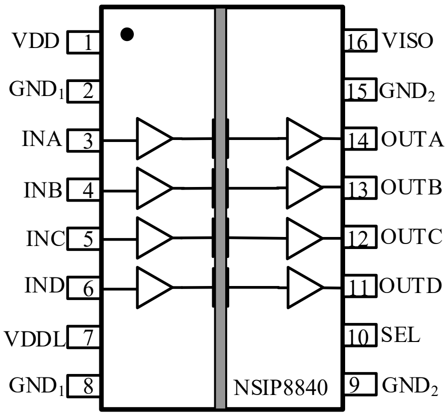


Figure 1.1 NSIP8840 Package

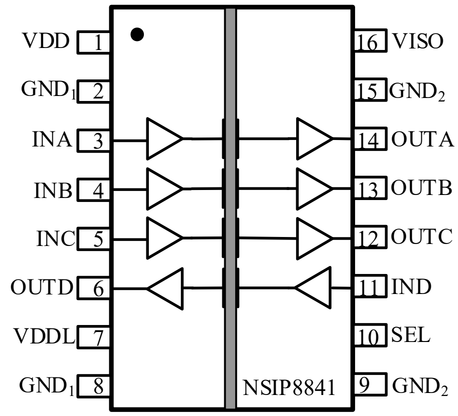


Figure 1.2 NSIP8841 Package

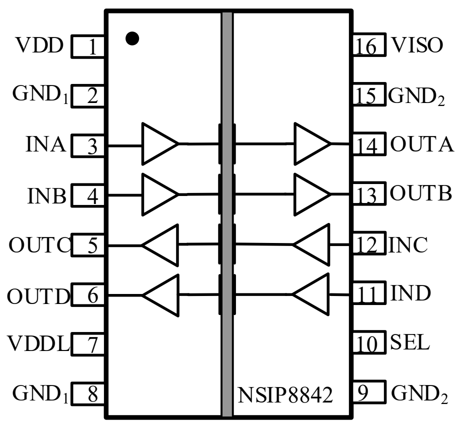


Figure 1.3 NSIP8842 Package

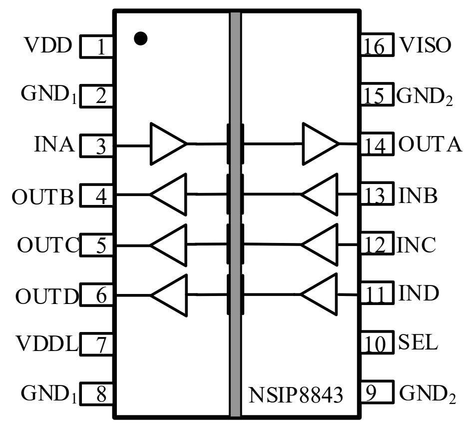


Figure 1.4 NSIP884x Package

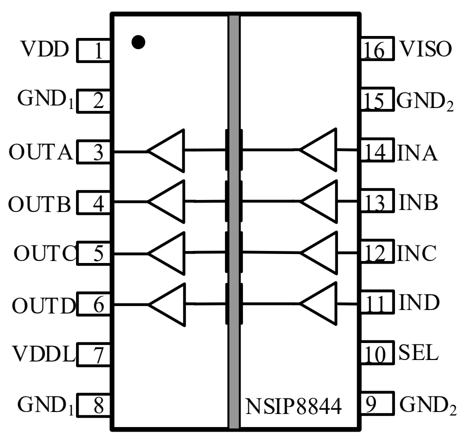


Figure 1.5 NSIP8844 Package

Table1.1 NSIP8840/ NSIP8841/ NSIP8842/ NSIP8843/NSIP8844 Pin Configuration and Description

NSIP8840 PIN NO.	***NSIP8841 PIN NO.***	***NSIP8842 PIN NO.***	***NSIP8843 PIN NO.***	***NSIP8844 PIN NO.***	***SYMBOL***	***FUNCTION***
1	1	1	1	1	VDD	Power Supply for Isolator Side 1
2	2	2	2	2	GND1	Ground 1, the ground reference for Isolator Side 1
3	3	3	3	14	INA	Logic Input A
4	4	4	13	13	INB	Logic Input B
5	5	12	12	12	INC	Logic Input C
6	11	11	11	11	IND	Logic Input D
7	7	7	7	7	VDDL	Side1 I/O logic level. When VDDL is not powered, the chip will shut down
8	8	8	8	8	GND1	Ground 1, the ground reference for Isolator Side 1
9	9	9	9	9	GND2	Ground 2, the ground reference for Isolator Side 2
10	10	10	10	10	SEL	VISO output voltage select, VISO=5V when SEL short to VISO, VISO=3.3V when SEL short to GND2 or floating.
11	6	6	6	6	OUTD	Logic Output D
12	12	5	5	5	OUTC	Logic Output C
13	13	13	4	4	OUTB	Logic Output B
14	14	14	14	3	OUTA	Logic Output A
15	15	15	15	15	GND2	Ground 2, the ground reference for Isolator Side 2
16	16	16	16	16	VISO	Secondary Supply Voltage Output for External Load.

2. Absolute Maximum Ratings

Parameters	***Symbol***	***Min***	***Typ***	***Max***	***Unit***	***Comments***
Power Supply Voltage	VDD	-0.5		6	V	
Side1 I/O logic level	VDDL			VDD	V	
Maximum Input Voltage	V_{INA}, V_{INB} V_{INC}, V_{IND}	-0.4		VCC1[2]+0.4[1]	V	

Maximum Output Voltage	V_{OUTA}, V_{OUTB} V_{OUTC}, V_{OUTD}	-0.4		VCC2[2]+0.4[1]	V	
Output current	Io	-15		15	mA	
Maximum Surge Isolation Voltage	V_{IOSM}			5.3	kV	
Operating Temperature	Topr	-40		125	℃	
Storage Temperature	Tstg	-40		150	℃	
Electrostatic discharge	HBM			±6000	V	
	CDM			±2000	V	

[1]VCC1 is input side supply, VCC2 is output side supply. For the isolator side1, VDDL is the VCC1.

3. Recommended Operating Conditions

Parameters	*Symbol*	*min*	*typ*	*max*	*unit*
Power Supply Voltage	VDD	3		5.5	V
Operating Temperature	Topr	-40		125	℃
High Level Input Voltage	VIH	0.7*VCC1[1]		VCC1[1]	V
Low Level Input Voltage	VIL	0		0.3*VCC1[1]	V
Data rate	DR			150	Mbps

[1]VCC1 is input side supply, VCC2 is output side supply. For the isolator side1, VDDL is the VCC1.

4. Thermal Characteristics

Parameters	*Symbol*	*SOW16*	*Unit*
IC Junction-to-Air Thermal Resistance	θ_{JA}	56.8	℃/W
Junction-to-case (top) thermal resistance	$\theta_{JC(top)}$	15.6	℃/W
Junction-to-board thermal resistance	θ_{JB}	28.5	℃/W

5. Specifications

5.1. Isolated DC/DC Converter Static Specifications

(VDD=4.5V~5.5V, VDDL=1.8V~5.5V,SEL=VISO, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VDD =VDDL= 5V, Ta = 25℃)

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Isolated Supply Voltage	VISO	4.75	5	5.25	V	
Line Regulation	$V_{ISO(LINE)}$			2	mV/V	
Load Regulation	$V_{ISO(LOAD)}$		0.2	0.5	%	

Output Ripple	$V_{ISO(RIP)}$		35		mVpp	
Output Noise	$V_{ISO(NOISE)}$		150		mVpp	
Efficiency at maximum load current	EFF	39	50		%	I_{ISO}=100mA,VDDL=VDD
Output supply current	I_{ISO}	100			mA	
VDD supply current without digital isolator	I_{VDD_POWER}		10	20	mA	No VISO Load
			197	270	mA	I_{ISO}=100mA

(VDD=4.5V~5.5V, VDDL=1.8V~5.5V,SEL=0V, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VDD =VDDL= 5V, Ta = 25℃)

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Isolated Supply Voltage	VISO	3.135	3.3	3.465	V	
Line Regulation	$V_{ISO(LINE)}$			2	mV/V	
Load Regulation	$V_{ISO(LOAD)}$		0.2	0.5	%	
Output Ripple	$V_{ISO(RIP)}$		35		mVpp	
Output Noise	$V_{ISO(NOISE)}$		150		mVpp	
Efficiency at maximum load current	EFF	28	41.5		%	I_{ISO}=100mA,VDDL=VDD
Output supply current	I_{ISO}	100			mA	
VDD supply current without digital isolator	I_{VDD_POWER}		8	20	mA	No VISO Load
			157	230	mA	I_{ISO}=100mA

(VDD=3V~3.6V, VDDL=1.8V~5.5V,SEL=0V, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VDD =VDDL= 3.3V, Ta = 25℃)

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Isolated Supply Voltage	VISO	3.2	3.3	3.5	V	
Line Regulation	$V_{ISO(LINE)}$			2	mV/V	
Load Regulation	$V_{ISO(LOAD)}$		0.2	2.1	%	
Output Ripple	$V_{ISO(RIP)}$		40		mVpp	
Output Noise	$V_{ISO(NOISE)}$		100		mVpp	
Efficiency at maximum load current	EFF	39	48		%	I_{ISO}=60mA,VDDL=VDD
Output supply current	I_{ISO}	60			mA	

VDD supply current without digital isolator	I_{VDD_POWER}		10	20	mA	No VISO Load
			123	160	mA	I_{ISO}=60mA

5.2. Digital Isolator Electrical Characteristics

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Power on Reset	V_{DDPOR}		2.5	3	V	POR threshold as during power-up
	V_{DDHYS}		0.2		V	POR threshold Hysteresis
High Level Input Voltage	V_{IH}	0.7*VCC1			V	
Low Level Input Voltage	V_{IL}			0.3*VCC1	V	
High Level Output Voltage	V_{OH}	0.8*VCC2			V	$I_{OH} \geq -4mA$
Low Level Output Voltage	V_{OL}			0.2*VCC2	V	$I_{OL} \leq 4mA$
Output Impedance	Rout		50		ohm	
Input Pull high or low Current	I_{pull}		8	15	uA	
Common Mode Transient Immunity	CMTI	100	150		kV/us	
Thermal Shutdown Temperature			165		℃	

[1]VCC1 is input side supply,VCC2 is output side supply. For the isolatoe side1,VDDL is the VCC1.

(VDD=4.5V~5.5V, VDDL=1.8V~5.5V,SEL=VISO, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VDD =VDDL= 5V, Ta = 25℃)

Parameters	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Comments*
Supply current	NSIP8840					
	$I_{DD(Q0)}$		10.3	20	mA	All Input 0V for NSIP8840W0 or All Input at supply for NSIP8840W1
	$I_{DD(Q1)}$		11	30	mA	All Input at supply for NSIP8840W0 or All Input 0V for NSIP8840W1
	$I_{DD(1M)}$		11.6	35	mA	All Input with 1Mbps, C_L=15pF
	NSIP8841					
	$I_{DD(Q0)}$		10.3	20	mA	All Input 0V for NSIP8841W0 or All Input at supply for NSIP8841W1
	$I_{DD(Q1)}$		12.3	30	mA	All Input at supply for NSIP8841W0 or All Input 0V for NSIP8841W1
	$I_{DD(1M)}$		12.7	35	mA	All Input with 1Mbps, C_L=15pF

	NSIP8842					
	$I_{DD(Q0)}$		10.3	20	mA	All Input 0V for NSIP8842W0 or All Input at supply for NSIP8842W1
	$I_{DD(Q1)}$		14.3	30	mA	All Input at supply for NSIP8842W0 or All Input 0V for NSIP8842W1
	$I_{DD(1M)}$		20	35	mA	All Input with 1Mbps, C_L=15pF
	NSIP8843					
	$I_{DD(Q0)}$		10.3	20	mA	All Input 0V for NSIP8843W0 or All Input at supply for NSIP8843W1
	$I_{DD(Q1)}$		16.3	30	mA	All Input at supply for NSIP8843W0 or All Input 0V for NSIP8843W1
	$I_{DD(1M)}$		27.3	50	mA	All Input with 1Mbps, C_L=15pF
	NSIP8844					
	$I_{DD(Q0)}$		10.3	20	mA	All Input 0V for NSIP8844W0 or All Input at supply for NSIP8844W1
	$I_{DD(Q1)}$		18.3	30	mA	All Input at supply for NSIP8844W0 or All Input 0V for NSIP8844W1
	$I_{DD(1M)}$		35	50	mA	All Input with 1Mbps, C_L=15pF
Data Rate	DR	0		150	Mbps	
Minimum Pulse Width	PW			5.0	ns	
Propagation Delay	t_{PLH}	5	9.0	16	ns	
	t_{PHL}	5	9.0	16	ns	
Pulse Width Distortion	PWD			5.0	ns	$\lvert t_{PHL} - t_{PLH} \rvert$
Rising Time	t_r			5.0	ns	C_L = 15pF
Falling Time	t_f			5.0	ns	C_L = 15pF
Channel-to-Channel Delay Skew	$t_{SK(c2c)}$			2.5	ns	
Part-to-Part Delay Skew	$t_{SK(p2p)}$			5.0	ns	

(VDD=4.5V~5.5V, VDDL=1.8V~5.5V,SEL=0V, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VDD =VDDL= 5V, Ta = 25℃)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Supply current	NSIP8840					
	$I_{DD(Q0)}$		7.8	20	mA	All Input 0V for NSIP8840W0 or All Input at supply for NSIP8840W1
	$I_{DD(Q1)}$		8	25	mA	All Input at supply for NSIP8840W0 or All Input 0V for NSIP8840W1
	$I_{DD(1M)}$		8.78	20	mA	All Input with 1Mbps, C_L=15pF
	NSIP8841					
	$I_{DD(Q0)}$		7.8	20	mA	All Input 0V for NSIP8841W0 or All Input at supply for NSIP8841W1
	$I_{DD(Q1)}$		9.8	25	mA	All Input at supply for NSIP8841W0 or All Input 0V for NSIP8841W1
	$I_{DD(1M)}$		11.7	30	mA	All Input with 1Mbps, CL=15pF
	NSIP8842					
	$I_{DD(Q0)}$		7.8	20	mA	All Input 0V for NSIP8842W0 or All Input at supply for NSIP8842W1
	$I_{DD(Q1)}$		11.8	25	mA	All Input at supply for NSIP8842W0 or All Input 0V for NSIP8842W1
	$I_{DD(1M)}$		15.3	30	mA	All Input with 1Mbps, C_L=15pF
	NSIP8843					
	$I_{DD(Q0)}$		7.8	20	mA	All Input 0V for NSIP8843W0 or All Input at supply for NSIP8843W1
	$I_{DD(Q1)}$		13.8	25	mA	All Input at supply for NSIP8843W0 or All Input 0V for NSIP8843W1
	$I_{DD(1M)}$		20.3	40	mA	All Input with 1Mbps, C_L=15pF
	NSIP8844					
	$I_{DD(Q0)}$		7.8	20	mA	All Input 0V for NSIP8844W0 or All Input at supply for NSIP8844W1
	$I_{DD(Q1)}$		15.8	25	mA	All Input at supply for NSIP8844W0 or All Input 0V for NSIP8844W1
	$I_{DD(1M)}$		25.3	40	mA	All Input with 1Mbps, C_L=15pF
Data Rate	DR	0		150	Mbps	
Minimum Pulse Width	PW			5.0	ns	

Propagation Delay	t_{PLH}	5	9.0	16	ns	
	t_{PHL}	5	9.0	16	ns	
Pulse Width Distortion	PWD			5.0	ns	$\|t_{PHL} - t_{PLH}\|$
Rising Time	t_r			5.0	ns	C_L = 15pF
Falling Time	t_f			5.0	ns	C_L = 15pF
Channel-to-Channel Delay Skew	$t_{SK(c2c)}$			2.5	ns	
Part-to-Part Delay Skew	$t_{SK(p2p)}$			5.0	ns	

(VDD=3V~3.6V, VDDL=1.8V~5.5V,SEL=0V, Ta=-40℃ to 125℃. Unless otherwise noted, Typical values are at VDD =VDDL= 3.3V, Ta = 25℃)

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Supply current	NSIP8840					
	$I_{DD(Q0)}$		9	20	mA	All Input 0V for NSIP8840W0 or All Input at supply for NSIP8840W1
	$I_{DD(Q1)}$		10	25	mA	All Input at supply for NSIP8840W0 or All Input 0V for NSIP8840W1
	$I_{DD(1M)}$		10	30	mA	All Input with 1Mbps, CL=15pF
	NSIP8841					
	$I_{DD(Q0)}$		9	20	mA	All Input 0V for NSIP8841W0 or All Input at supply for NSIP8841W1
	$I_{DD(Q1)}$		11.25	25	mA	All Input at supply for NSIP8841W0 or All Input 0V for NSIP8841W1
	$I_{DD(1M)}$		10.14	30	mA	All Input with 1Mbps, CL=15pF
	NSIP8842					
	$I_{DD(Q0)}$		9	20	mA	All Input 0V for NSIP8842W0 or All Input at supply for NSIP8842W1
	$I_{DD(Q1)}$		13.5	25	mA	All Input at supply for NSIP8842W0 or All Input 0V for NSIP8842W1
	$I_{DD(1M)}$		16.5	30	mA	All Input with 1Mbps, CL=15pF
	NSIP8843					
	$I_{DD(Q0)}$		9	20	mA	All Input 0V for NSIP8843W0 or All Input at supply for NSIP8843W1
	$I_{DD(Q1)}$		15.75	25	mA	All Input at supply for NSIP8843W0 or All Input 0V for NSIP8843W1
	$I_{DD(1M)}$		21.4	50	mA	All Input with 1Mbps, CL=15pF

	NSIP8844					
	$I_{DD(Q0)}$		9	20	mA	All Input 0V for NSIP8844W0 or All Input at supply for NSIP8844W1
	$I_{DD(Q1)}$		18	30	mA	All Input at supply for NSIP8844W0 or All Input 0V for NSIP8844W1
	$I_{DD(1M)}$		26.5	50	mA	All Input with 1Mbps, CL=15pF
Data Rate	DR	0		150	Mbps	
Minimum Pulse Width	PW			5.0	ns	
Propagation Delay	t_{PLH}	5	9.0	16	ns	
	t_{PHL}	5	9.0	16	ns	
Pulse Width Distortion	PWD			5.0	ns	$\|t_{PHL} – t_{PLH}\|$
Rising Time	t_r			5.0	ns	C_L = 15pF
Falling Time	t_f			5.0	ns	C_L = 15pF
Channel-to-Channel Delay Skew	$t_{SK(c2c)}$			2.5	ns	
Part-to-Part Delay Skew	$t_{SK(p2p)}$			5.0	ns	

5.3. Typical Performance Characteristics

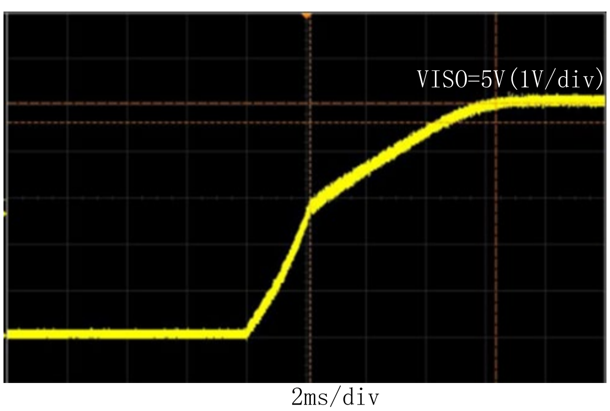


Figure 5.1 5V→5V Soft start at no load

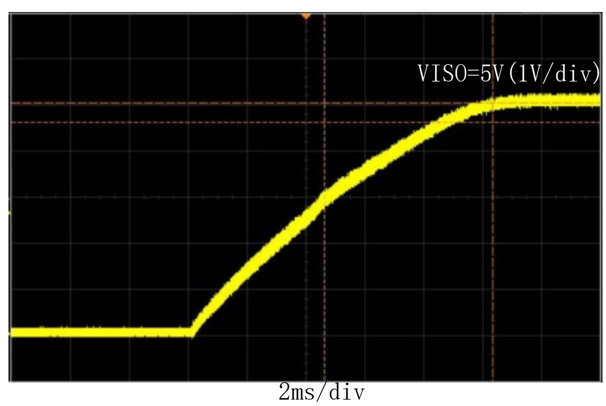


Figure 5.2 5V→5V Soft start at full load

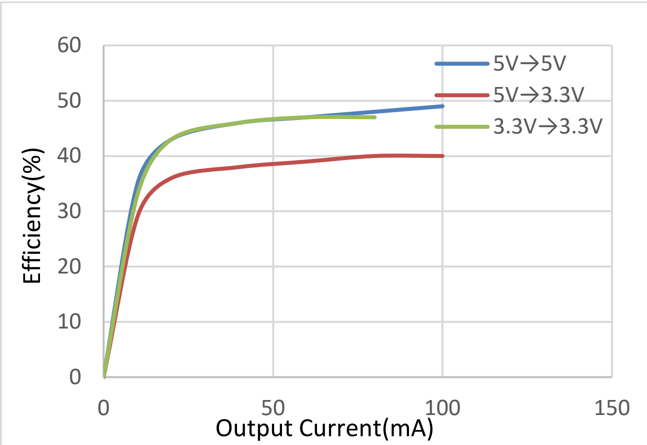


Figure 5.3 Output current vs efficiency

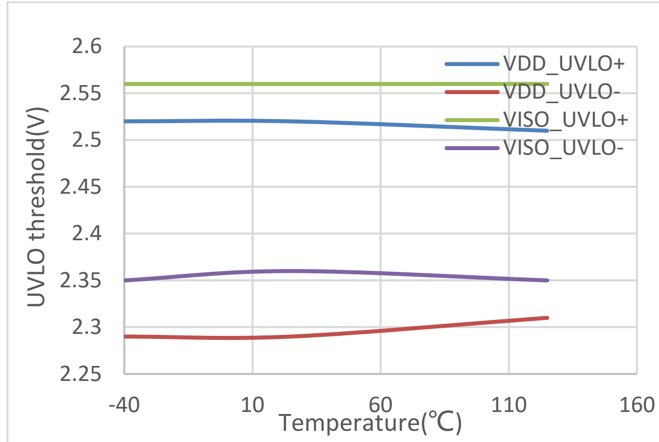


Figure 5.4 Power-Supply Undervoltage Threshold vs Temperature

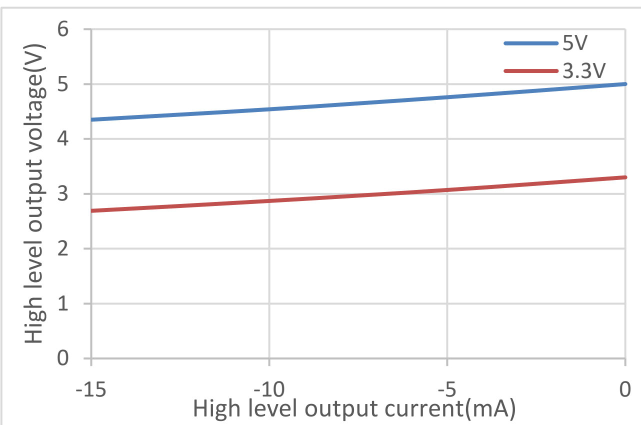


Figure 5.5 High-Level Output Voltage vs Output Current

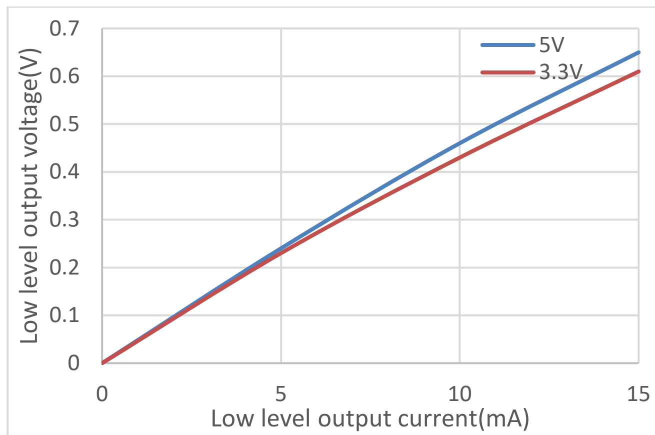


Figure5.6 Low-Level Output Voltage vs Output Current

5.4. Parameter Measurement Information

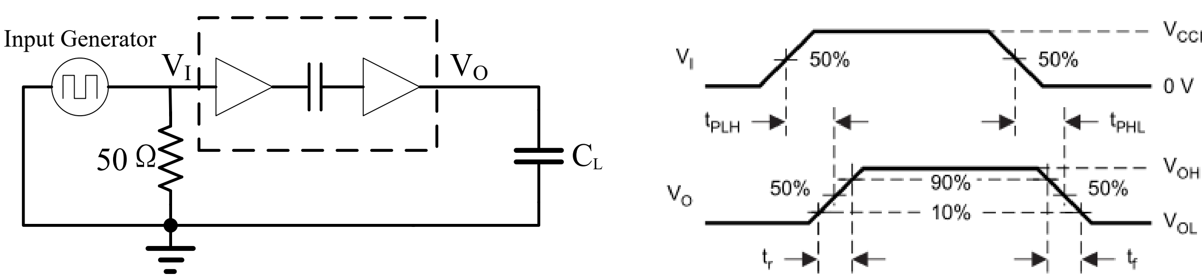


Figure 5.7 Switching Characteristics Test Circuit and Waveform

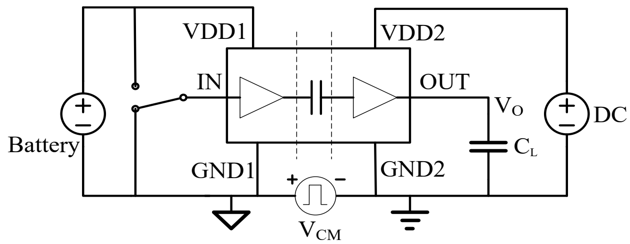


Figure 5.8 Common-Mode Transient Immunity Test Circuit

6. High Voltage Feature Description

6.1. Insulation and Safety Related Specifications

Parameters	*Symbol*	*Value*	*Unit*	*Comments*
Minimum External Clearance	CLR	8	mm	IEC 60664-1:2007
Minimum External Creepage	CPG	8	mm	IEC 60664-1:2007
Distance Through Insulation	DTI	20	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

Description	*Test Condition*	*Value*
Overvoltage Category per IEC60664-1	For Rated Mains Voltage ≤ 150Vrms	I to IV
	For Rated Mains Voltage ≤ 300Vrms	I to III
	For Rated Mains Voltage ≤ 600Vrms	I to II
Climatic Classification		40/125/21
Pollution Degree per DIN VDE 0110,		2

6.2. Insulation Characteristics

Description	*Test Condition*	*Symbol*	*Value*	*Unit*
Maximum repetitive isolation voltage		V_{IORM}	565	V_{PEAK}
Maximum working isolation voltage	AC Voltage	V_{IOWM}	400	V_{RMS}
	DC Voltage		565	V_{DC}
Apparent Charge	Method a, after Input/output safety test subgroup 2/3, $Vini=V_{IOTM}$, $t_{ini}=60$ s , $V_{pd(m)}=1.2*V_{IORM}$, t_m=10s.	q_{pd}	<5	pC

Description	***Test Condition***	***Symbol***	***Value***	***Unit***
	Method a, after environmental tests subgroup 1, Vini=V_{IOTM}, t_{ini}=60s ,$V_{pd(m)}$=1.3*V_{IORM}, t_m=10s			pC
	Method b, routine test (100% production) and preconditioning (type test);V_{ini}=1.2*V_{IOTM}, t_{ini}=1s $V_{pd\ (m)}$=1.5*V_{IORM}, t_m=1s （method b1） or $V_{pd(m)}$=Vini, t_m=t_{ini}(method b2)			pC
Maximum transient isolation voltage	t = 60 sec	V_{IOTM}	5300	V_{PEAK}
Maximum impulse voltage	Tested in air, 1.2/50-us waveform per IEC62368-1	V_{IMP}	7000	V_{PEAK}
Maximum Surge Isolation Voltage	Test method per IEC62368-1, 1.2/50us waveform, V_{IOSM}≥V_{IMP} × 1.3	V_{IOSM}	9100	V_{PEAK}
Isolation resistance	V_{IO} =500V, T_{amb}=25℃	R_{IO}	>10^{12}	Ω
	V_{IO} =500V, 100℃ ≤ T_{amb} ≤ 125℃	R_{IO}	>10^{11}	Ω
	V_{IO} =500V, T_{amb}=T_s	R_{IO}	>10^9	Ω
Isolation capacitance	f = 1MHz	C_{IO}	0.6	pF
Safety total power dissipation	$θ_{JA}$ = 56.8 °C/W, V_I = 5.5V, T_J = 150 ℃, T_A = 25 ℃	Ps	2201	mW
Safety input, output, or supply current	$θ_{JA}$ = 56.8 °C/W, V_I = 5.5 V, T_J = 150 °C, T_A = 25 °C	Is	400	mA
Maximum safety temperature		Ts	150	℃
UL1577				
Insulation voltage per UL	V_{TEST} = V_{ISO}, t = 60 s (qualification), V_{TEST} = 1.2 × V_{ISO}, t = 1 s (100% production test)	V_{ISO}	5000	V_{RMS}

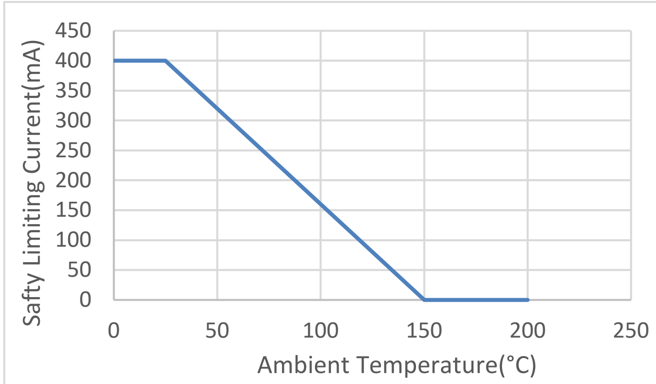


Figure 6.1 NSIP884x Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN VDE V 0884-17

6.3. Regulatory Information

The NSIP884x are approved by the organizations listed in table.

UL		***VDE***	***CQC***
UL 1577 Component Recognition Program	Approved under CSA Component Acceptance Notice 5A	Certified according to DIN EN IEC 60747-17 (VDE 0884-17)	Certified according to GB4943.1
Single Protection, 5000V_{rms} Isolation voltage	Single Protection, 5000V_{rms} Isolation voltage	Basic Insulation V_{IORM}=565Vpeak V_{IOTM}=5300Vpeak V_{IOSM}=9100Vpeak	Basic insulation
E500602	E500602	40057024	CQC20001264939

7. Function Description

7.1. Overview

The NSIP884x devices are quad-channel digital isolators with integrated isolated DC-DC converter. The digital isolators are based on Novosense capacity isolation barrier technique. The isolated DC-DC converter provides up to 500mW output power using on chip transformer. The feedback PWM signal is sent to primary side by a digital isolator based on capacity isolation technology. The NSIP884x device are safety certified by UL1577 support 5kVrms insulation withstand voltages, while providing high electromagnetic immunity and low emissions. The data rate of the NSIP884x is up to 150Mbps, and the common-mode transient immunity (CMTI) is up to 150kV/us. The logical level of digital isolators on left side can be set by VDDL pin which can support the application when the supply voltage and I/O voltage level are different.

The high integrated solution can help to simplify system design and improve reliability. The NSIP884x devices are suitable for the limited PCB space applications. The devices are also suitable for wide temperature application which the most the power module can not support.

7.2. Device Functional Modes

The NSIP884x devices provide 5V to 5V, 5V to 3.3V, 3.3V to 3.3V conversion mode, the output voltage can be set by SEL pin. Supply configuration table showed below.

SEL PIN	VDD	VISO
Shorted to VISO	5V	5V
Shorted to GND2 or floating	5V	3.3V
Shorted to GND2 or floating	3.3V	3.3V

The NSIP884x devices provide four channel digital isolators. The digital isolators have default weak pull up or pull down input status when input is floating as shown in below table.

Input	VDD1 status	VDDOUT status	Output	Comment
H	Ready	Ready	H	Normal operation.
L	Ready	Ready	L	
floating	Ready	Ready	L(NSIP884xW0) H(NSIP884xW1)	Floating input status

7.3. EMI Considerations

The NSIP884x devices are using on chip transformer, so the power transfer must operate at high frequency allow higher efficiency transfer using the small transformer. This will cause emissions which need to pay attention to PCB layout if the application allow low emission. Please see the application note if needed.

7.4. Output Short and Over Temperature Protection

The NSIP884x devices are protected against output short. When the devices detect the output is short, the device will be in Hiccup mode and the transfer power will be limited. So the temperature of the device will be low, and the device is protected.

The NSIP884x devices are also protected against over temperature. When the devices detect the chip is over 165℃, the device will be shut down until the temperature of the device is below 145℃.

8. Application Note

8.1. Typical Application

The NSIP884x requires a 0.1 µF and 10uF bypass capacitors between VDD and GND1, VISO and GND2. The capacitor should be placed as close as possible to the package. This is very important for the performance of the device. The figure 8.1 is the basic schematic of NSIP884x and the figure 8.2 is the typical isolated RS485 schematic using NSIP884x.

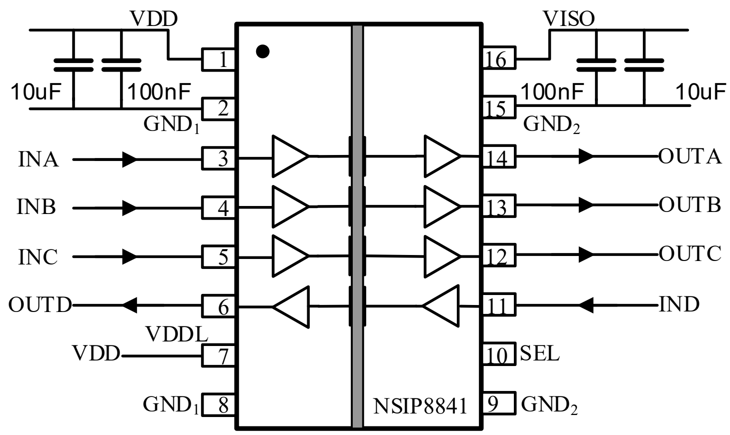


Figure 8.1 Basic schematic of NSIP884x

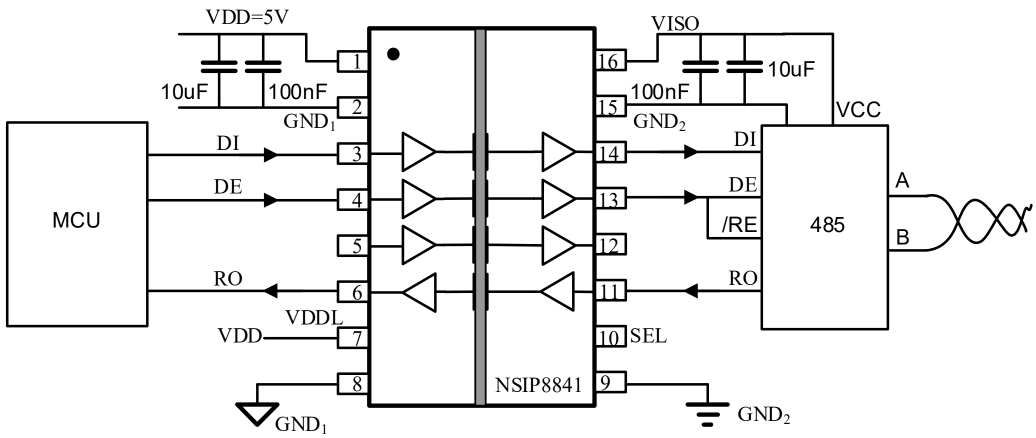


Figure 8.2 Isolated RS485 schematic using NSIP884x

8.2. Pcb Layout

The recommended PCB layout shown below. The low ESR capacitor C1 should be closed to PIN1 and PIN2, the distance should be less than 1mm. The low ESR capacitor C3 should be closed to PIN15 and PIN16, the distance should be less than 1mm.

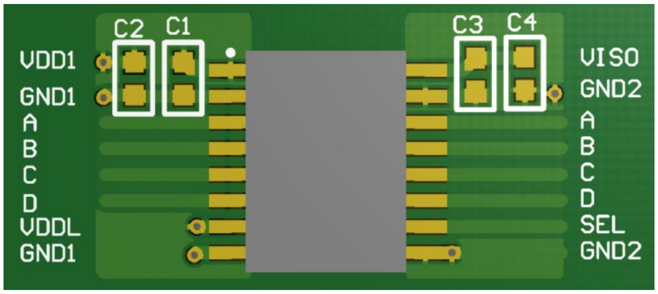


Figure 8.3 Recommended PCB Layout — Top Layer

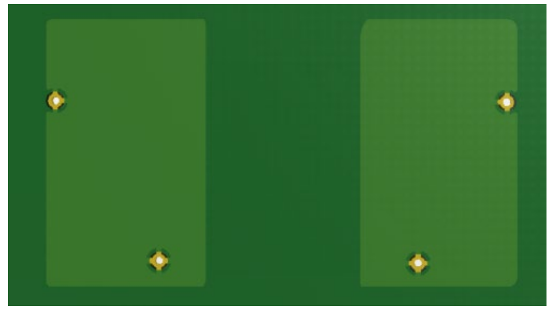
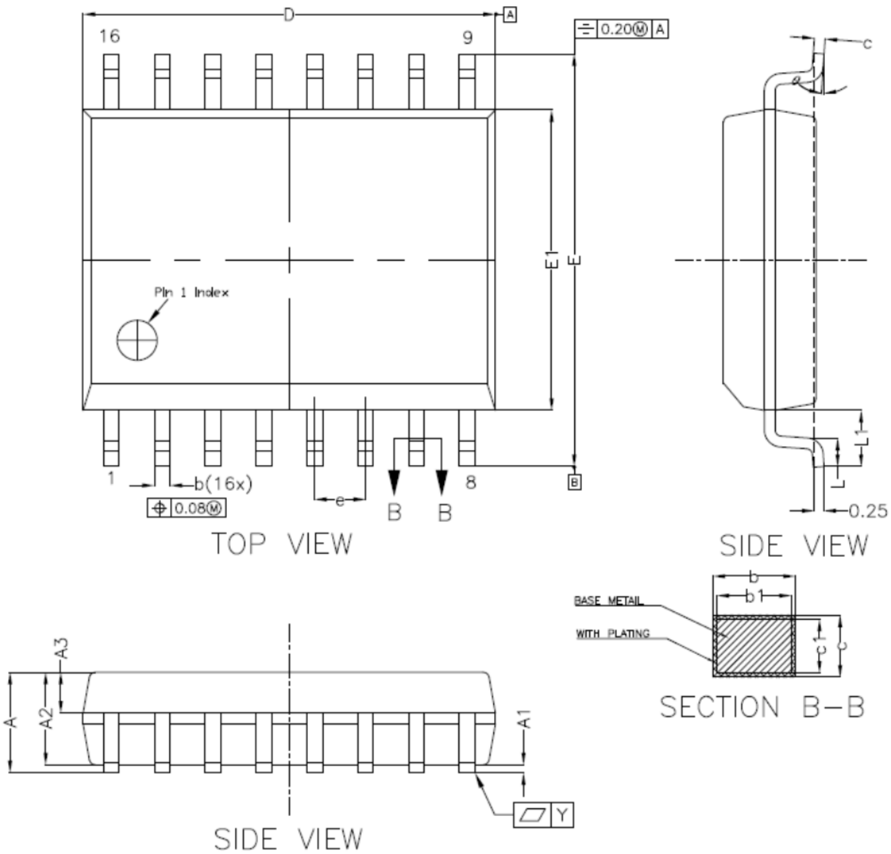


Figure 8.4 Recommended PCB Layout — Bottom Layer

9. Package Information



* CONTROLLING DIMENSION : MM

SYMBOL	MILLIMETER		
	MIN.	NOM.	MAX.
A	---	---	2.65
A1	0.10	---	030
A2	2.25	2.30	2.35
A3	0.97	1.02	1.07
b	0.35	---	0.43
b1	0.34	0.37	0.40
c	0.25	---	0.29
c1	0.24	0.25	0.26
D	10.20	10.30	10.40
E	10.10	10.30	10.50
E1	7.40	7.50	7.60
e	1.27 bsc		
L1	1.40 bsc		
L	0.55	---	0.85
Y	---	0.10	---
θ	0°	---	8°

NOTES

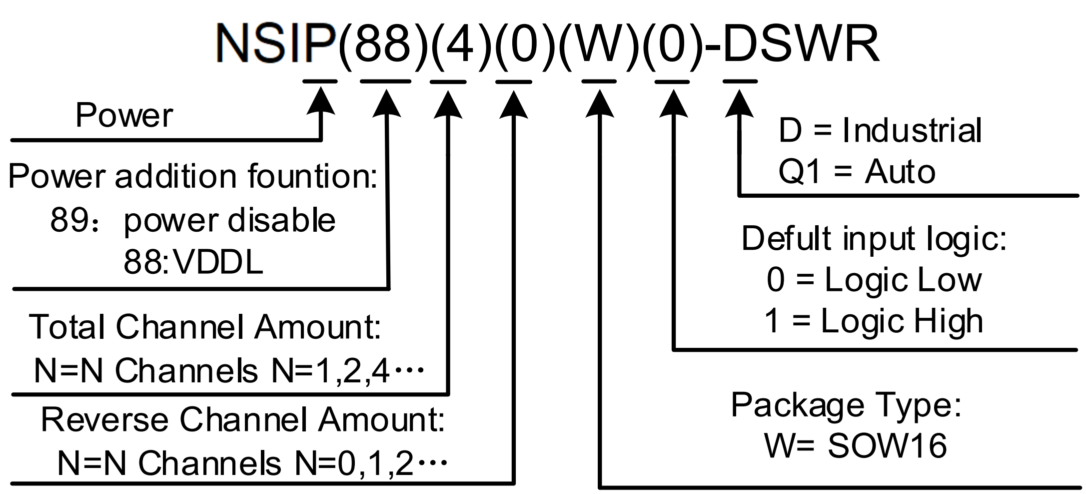
1.0 COPLANARITY APPLIES TO LEADS, CORNER LEADS AND DIE ATTACH PAD.

Figure 9.1 SOW16 Package Shape and Dimension in millimeters

10. Order Information

Part Number	*Isolation Rating (kV)*	*Number of side 1 inputs*	*Number of side 2 inputs*	*Max Data Rate (Mbps)*	*Default intput logic*	*Temperature*	*MSL*	*Package Type*	*Package Drawing*	*SPQ*
NSIP8840W0-DSWR	5	4	0	150	Low	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8840W1-DSWR	5	4	0	150	High	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8841W0-DSWR	5	3	1	150	Low	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8841W1-DSWR	5	3	1	150	High	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8842W0-DSWR	5	2	2	150	Low	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8842W1-DSWR	5	2	2	150	High	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8843W0-DSWR	5	1	3	150	Low	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8843W1-DSWR	5	1	3	150	High	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8844W0-DSWR	5	0	4	150	Low	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000
NSIP8844W1-DSWR	5	0	4	150	High	-40 to 125℃	3	SOP16 (300mil)	SOW16	1000

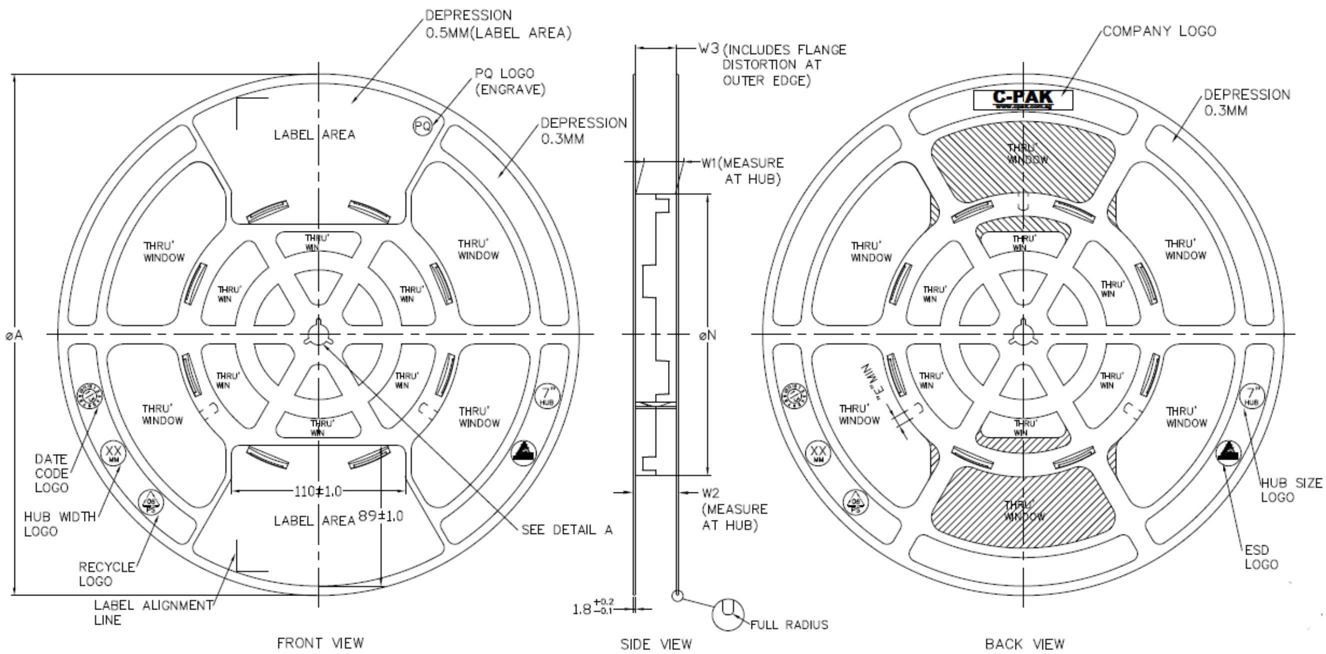
Part Number Rule:

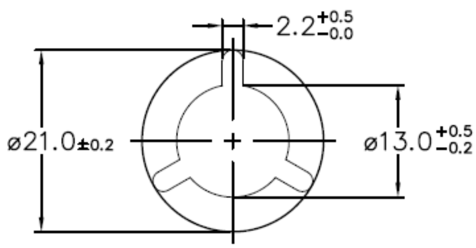


11. Documentation Support

Part Number	*Product Folder*	*Datasheet*	*Technical Documents*	*Isolator selection guide*
NSIP884x	Click here	Click here	Click here	Click here

12. Tape And Reel Information

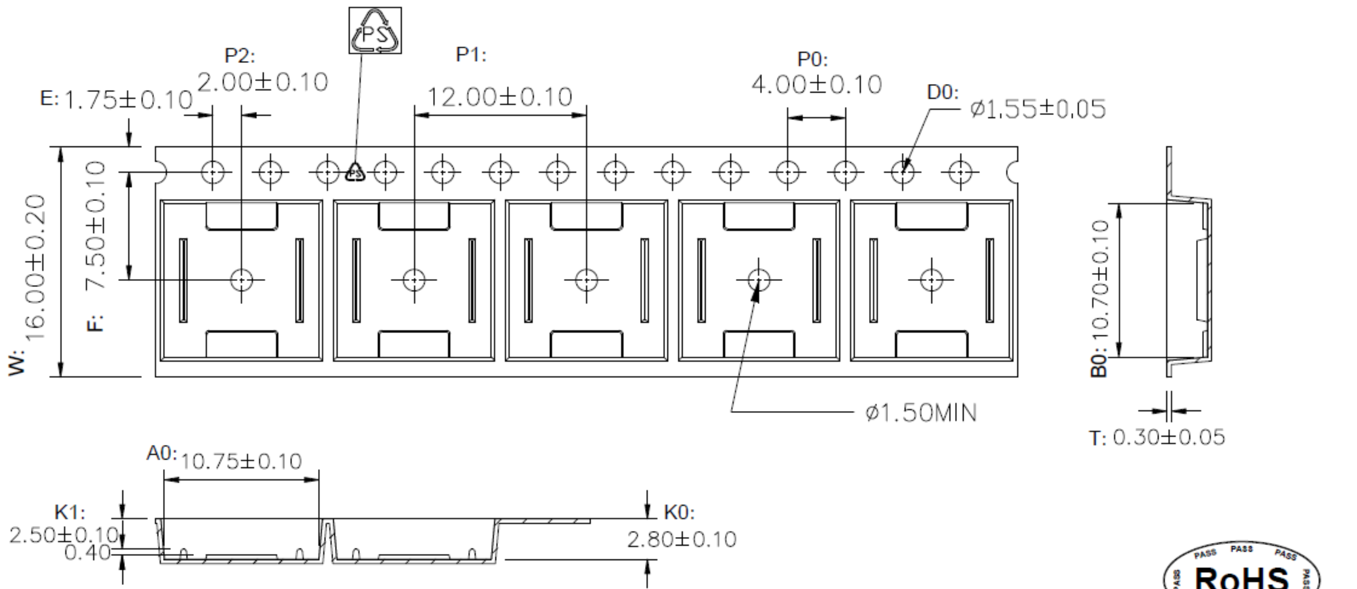




ARBOR HOLE
DETAIL A
SCALE : 3:1

PRODUCT SPECIFICATION						
TAPE WIDTH	ØA ±2.0	ØN ±2.0	W1	W2 (MAX)	W3	E (MIN)
08MM	330	178	$8.4^{+1.5}_{-0.0}$	14.4	SHALL ACCOMMODATE TAPE WIDTH WITHOUT INTERFERENCE	5.5
12MM	330	178	$12.4^{+2.0}_{-0.0}$	18.4		5.5
16MM	330	178	$16.4^{+2.0}_{-0.0}$	22.4		5.5
24MM	330	178	$24.4^{+2.0}_{-0.0}$	30.4		5.5
32MM	330	178	$32.4^{+2.0}_{-0.0}$	38.4		5.5

SURFACE RESISTIVITY			
LEGEND	SR RANGE	TYPE	COLOUR
A	BELOW 10^{12}	ANTISTATIC	ALL TYPES
B	10^{6} TO 10^{11}	STATIC DISSIPATIVE	BLACK ONLY
C	10^{5} & BELOW 10^{5}	CONDUCTIVE (GENERIC)	BLACK ONLY
E	10^{9} TO 10^{11}	ANTISTATIC (COATED)	ALL TYPES



1. 10 sprocket hole pitch cumulative tolerance ±0.20 .
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy .
4. All dimensions meet EIA-481 requirements.
5. Thickness : 0.30±0.05mm.
6. Packing length per 22" reel : 378 Meters.(復卷 N=122）
7. Component load per 13" reel : 1000 pcs.
8. Surface resistivity :10^{5} ~ 10^{10} Ω/□

W	16.00±0.20
A0	10.75±0.10
B0	10.70±0.10
K0	2.80±0.10
K1	2.50±0.10

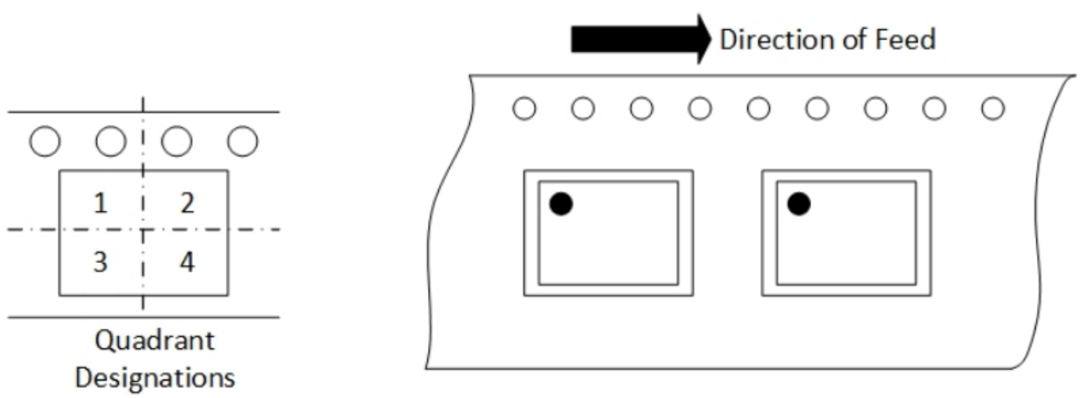


Figure 12.1 Tape and Reel Information of SOW16

13. Revision History

Revision	Description	Date
1.0	Initial version	2021/3/28
1.1	Updating relative figures	2022/5/9
1.2	Describe the function of VDDL in detail. Update safety certification info throughout the document.	2023/11/21

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