



High Reliability Reinforced Six-Channel Digital Isolators for IPM

Datasheet (EN) 1.2

Product Overview

NSi8266 is a high reliability six-channel digital isolator, The NSi8266 device is safety certified by UL1577 support several insulations withstand voltage(3kV,5kV), while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of NSi8266 is up to 150Mbps, and the common-mode transient immunity (CMTI) is up to 200kV/us. NSi8266’s default output is low when input power is lost to prevent IPM switching during power on stage. Wide supply voltage of NSi8266 supports to connect with most digital interface directly. High system level EMC performance enhance reliability and stability of use. NSi8266 has the interlock function for adjacent channels to provide the shoot-through protection, to eliminate the short-circuit risk of IGBT inside the IPM, to enhance system robust.

Key Features

- Up to 5000V_{rms} Insulation voltage
- Data rate: DC to 150Mbps
- Power supply voltage: 2.5V to 5.5V
- High CMTI: 200kV/us
- Chip level ESD: HBM: ±6kV
- Interlock function
- High system level EMC performance:
 - Enhanced system level ESD, EFT, Surge immunity
- Default output low level option
- Low power consumption: 1.5mA/ch (1 Mbps)
- Low propagation delay: <15ns
- Operation temperature: -40°C~125°C
- RoHS-compliant packages:
 - SOP16(300mil)
 - SSOP16

Safety Regulatory Approvals

- UL recognition: up to 5000V_{rms} for 1 minute per UL1577
- CQC certification per GB4943.1-2011
- CSA component notice 5A approval IEC60950-1 standard
- DIN VDE V 0884-11:2017-01

Applications

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

Device Information

Part Number	Package	Body Size
NSi8266W0-DSWR	SOP16(300mil)	10.30mm × 7.50mm
NSi8266S0-DSSR	SSOP16	4.90mm × 3.90mm

Functional Block Diagrams

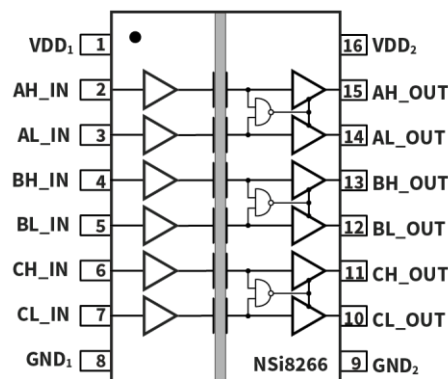


Figure 1. NSi8266 Block Diagram

INDEX

1. PIN CONFIGURATION AND FUNCTIONS	3
2. ABSOLUTE MAXIMUM RATINGS	4
3. RECOMMENDED OPERATING CONDITIONS	4
4. THERMAL INFORMATION.....	5
5. SPECIFICATIONS	5
5.1. ELECTRICAL CHARACTERISTICS.....	5
5.2. SUPPLY CURRENT CHARACTERISTICS – 5V SUPPLY	5
5.3. SUPPLY CURRENT CHARACTERISTICS –3.3V SUPPLY.....	6
5.4. SUPPLY CURRENT CHARACTERISTICS–2.5V SUPPLY	6
5.5. SWITCHING CHARACTERISTICS - 5V SUPPLY.....	8
5.6. SWITCHING CHARACTERISTICS - 3.3V SUPPLY.....	8
5.7. SWITCHING CHARACTERISTICS - 2.5V SUPPLY.....	9
5.8. TYPICAL PERFORMANCE CHARACTERISTICS	10
5.9. PARAMETER MEASUREMENT INFORMATION	10
6. HIGH VOLTAGE FEATURE DESCRIPTION	11
6.1. INSULATION AND SAFETY RELATED SPECIFICATIONS	11
6.2. SAFETY-LIMITING VALUES	12
6.3. REGULATORY INFORMATION.....	13
7. FUNCTION DESCRIPTION	15
7.1. OVERVIEW.....	15
7.2. OOK MODULATION	15
7.3. SHOOT THROUGH PROTECTION.....	16
8. APPLICATION NOTE	17
8.1. TYPICAL APPLICATION CIRCUIT	17
8.2. PCB LAYOUT	17
8.3. HIGH SPEED PERFORMANCE.....	18
8.4. TYPICAL SUPPLY CURRENT EQUATIONS	18
9. PACKAGE INFORMATION	19
10. ORDERING INFORMATION	20
11. DOCUMENTATION SUPPORT	20
12. TAPE AND REEL INFORMATION	21
13. REVISION HISTORY	24

1. Pin Configuration and Functions

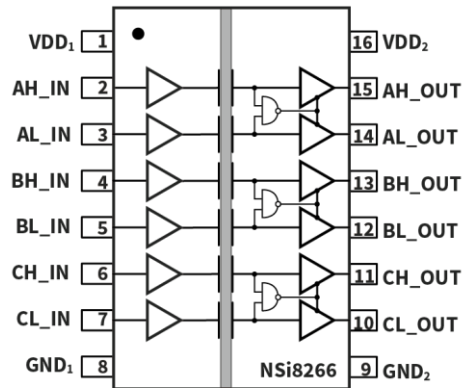


Figure 1.1 NSi8266 Package

Table 1.1 NSi8266 Pin Configuration and Description

NSi8266 PIN NO.	SYMBOL	FUNCTION
1	VDD ₁	Power Supply for Isolator Side 1
2	AH_IN	High side Logic Input AH
3	AL_IN	Low side Logic Input AL
4	BH_IN	High side Logic Input BH
5	BL_IN	Low side Logic Input BL
6	CH_IN	High side Logic Input CH
7	CL_IN	Low side Logic Input CL
8	GND ₁	Ground 1, the ground reference for Isolator Side 1
9	GND ₂	Ground 2, the ground reference for Isolator Side 2
10	CL_OUT	Low side Logic Output CL
11	CH_OUT	High side Logic Output CH
12	BL_OUT	Low side Logic Output BL
13	BH_OUT	High side Logic Output BH
14	AL_OUT	Low side Logic Output AL
15	AH_OUT	High side Logic Output AH
16	VDD ₂	Power Supply for Isolator Side 2

2. Absolute Maximum Ratings

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Power Supply Voltage	VDD1, VDD2	-0.5		6.5	V	
Maximum Input Voltage	VINA, VINB, VINC, VIND, VINE, VIN F	-0.4		VDD+0.4	V	The maximum voltage must not exceed 6.5V
Maximum Output Voltage	VOUTA, VOUTB, VOUTC, VOUTD, VOUT E, VOUT F	-0.4		VDD+0.4	V	The maximum voltage must not exceed 6.5V
Maximum Input/Output Pulse Voltage	ALL I/O Pin	-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	
Maximum Surge Isolation Voltage	V _{IOSM}			6.25	kV	
Operating Temperature	T _{opr}	-40		125	°C	
Junction Temperature	T _j			150	°C	
Storage Temperature	T _{stg}	-65		150	°C	
Electrostatic discharge	HBM			±6000	V	
	CDM			±2000	V	

3. Recommended Operating Conditions

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Power Supply Voltage	VDD1, VDD2	2.5		5.5	V	
High-level Input Voltage	V _{IH}	2			V	
Low-level Input Voltage	V _{IL}			0.8	V	
Data Rate	DR	0		150	Mbps	
Ambient Temperature	T _a	-40		125	°C	

4. Thermal Information

Parameters	Symbol	SOP16(300mil)	SSOP16	Unit
Junction-to-ambient thermal resistance	θ_{JA}	60.3	86.5	°C/W
Junction-to-case(top) thermal resistance	$\theta_{JC (top)}$	24.0	26.9	°C/W
Junction-to-board thermal resistance	θ_{JB}	29.3	36.6	°C/W

5. Specifications

5.1. Electrical Characteristics

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Power on Reset	VDD _{POR}		2.2		V	POR threshold as during power-up
	VDD _{HYS}		0.1		V	POR threshold Hysteresis
Input Threshold	V _{IT}		1.6		V	Input Threshold at rising edge
	V _{IT_HYS}		0.4		V	Input Threshold Hysteresis
High Level Input Voltage	V _{IH}	2			V	
Low Level Input Voltage	V _{IL}			0.8	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}		50		ohm	
Input Pull high or low Current	I _{pull}		8	15	μA	
Start Up Time after POR	tr _{bs}		10		μs	
Common Mode Transient Immunity	CMTI	±200	±250		kV/μs	

5.2. 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	NSi8266					
	I _{DD1} (Q0)		1.39	3.09	mA	All Input 0V
	I _{DD2} (Q0)		3.41	5.63	mA	
	I _{DD1} (Q1)		7.37	12.16	mA	All Input at supply
	I _{DD2} (Q1)		3.49	5.76	mA	
	I _{DD1} (16k)		4.39	7.24	mA	All Input with 16kbps, C _L =15pF
	I _{DD2} (16k)		3.67	6.06	mA	
	I _{DD1} (1M)		1.39	3.09	mA	All Input with 1Mbps, C _L =15pF
I _{DD2} (1M)		3.41	5.63	mA		

5.3. 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	NSi8266					
	I _{DD1} (Q0)		1.33	3.00	mA	All Input 0V
	I _{DD2} (Q0)		3.36	5.54	mA	
	I _{DD1} (Q1)		7.26	11.98	mA	All Input at supply
	I _{DD2} (Q1)		3.43	5.66	mA	
	I _{DD1} (16k)		4.31	7.11	mA	All Input with 16kbps, C _L =15pF
	I _{DD2} (16k)		3.55	5.86	mA	
	I _{DD1} (1M)		1.33	3.00	mA	All Input with 1Mbps, C _L =15pF
I _{DD2} (1M)		3.36	5.54	mA		

5.4. 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	NSi8266					
	$I_{DD1}(Q0)$		1.29	2.94	mA	All Input 0V
	$I_{DD2}(Q0)$		3.33	5.49	mA	
	$I_{DD1}(Q1)$		7	11.55	mA	All Input at supply
	$I_{DD2}(Q1)$		3.39	5.59	mA	
	$I_{DD1}(16k)$		4.17	6.88	mA	All Input with 16kbps, $C_L=15pF$
	$I_{DD2}(16k)$		3.47	5.73	mA	
	$I_{DD1}(1M)$		1.29	2.94	mA	All Input with 1Mbps, $C_L=15pF$
$I_{DD2}(1M)$		3.33	5.49	mA		

5.5. 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		150	Mbps	
Minimum Pulse Width	PW			5.0	ns	
Propagation Delay	t _{PLH}	2.5	6.54	15	ns	See Figure 5.5 , C _L = 15pF
	t _{PHL}	2.5	8.30	15	ns	See Figure 5.5 , C _L = 15pF
Pulse Width Distortion t _{PHL} - t _{PLH}	PWD			5.0	ns	See Figure 5.5 , C _L = 15pF
Rising Time	t _r			5.0	ns	See Figure 5.5 , C _L = 15pF
Falling Time	t _f			5.0	ns	See Figure 5.5 , C _L = 15pF
Peak Eye Diagram Jitter	t _{JIT} (PK)		350		ps	
Channel-to-Channel Delay Skew	t _{SK} (c2c)			2.5	ns	
Part-to-Part Delay Skew	t _{SK} (p2p)			5.0	ns	

5.6. 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		150	Mbps	
Minimum Pulse Width	PW			5.0	ns	
Propagation Delay	t _{PLH}	2.5	8.0	15	ns	See Figure 5.5 , C _L = 15pF
	t _{PHL}	2.5	8.7	15	ns	See Figure 5.5 , C _L = 15pF
Pulse Width Distortion t _{PHL} - t _{PLH}	PWD			5.0	ns	See Figure 5.5 , C _L = 15pF
Rising Time	t _r			5.0	ns	See Figure 5.5 , C _L = 15pF
Falling Time	t _f			5.0	ns	See Figure 5.5 , C _L = 15pF
Peak Eye Diagram Jitter	t _{JIT} (PK)		350		ps	

Parameters	Symbol	Min	Typ	Max	Unit	Comments
Channel-to-Channel Delay Skew	$t_{sk}(c2c)$			2.5	ns	
Part-to-Part Delay Skew	$t_{sk}(p2p)$			5.0	ns	

5.7. 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		150	Mbps	
Minimum Pulse Width	PW			5.0	ns	
Propagation Delay	t_{PLH}	2.5	9.0	15	ns	See Figure 5.5 , $C_L = 15pF$
	t_{PHL}	2.5	9.3	15	ns	See Figure 5.5 , $C_L = 15pF$
Pulse Width Distortion $ t_{PHL} - t_{PLH} $	PWD			5.0	ns	See Figure 5.5 , $C_L = 15pF$
Rising Time	t_r			5.0	ns	See Figure 5.5 , $C_L = 15pF$
Falling Time	t_f			5.0	ns	See Figure 5.5 , $C_L = 15pF$
Peak Eye Diagram Jitter	$t_{JIT}(PK)$		350		ps	
Channel-to-Channel Delay Skew	$t_{sk}(c2c)$			2.5	ns	
Part-to-Part Delay Skew	$t_{sk}(p2p)$			5.0	ns	

5.8. Typical Performance Characteristics

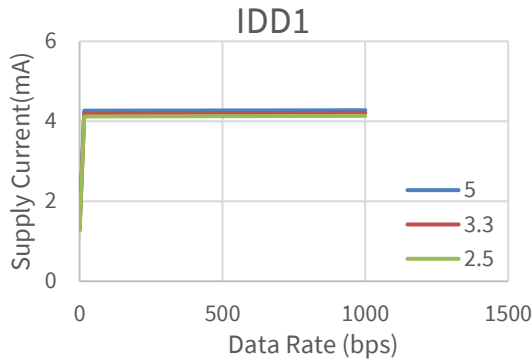


Figure 5.1 NSi8266 VDD1 Supply Current vs Data Rate



Figure 5.2 NSi8266 VDD2 Supply Current vs Data Rate

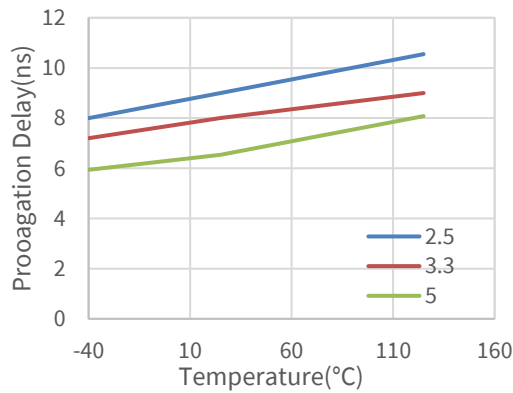


Figure 5.3 Rising Edge Propagation Delay Vs Temp

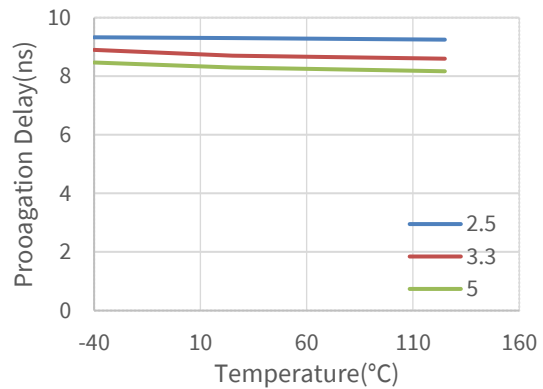


Figure 5.4 Falling Edge Propagation Delay Vs Temp

5.9. Parameter Measurement Information

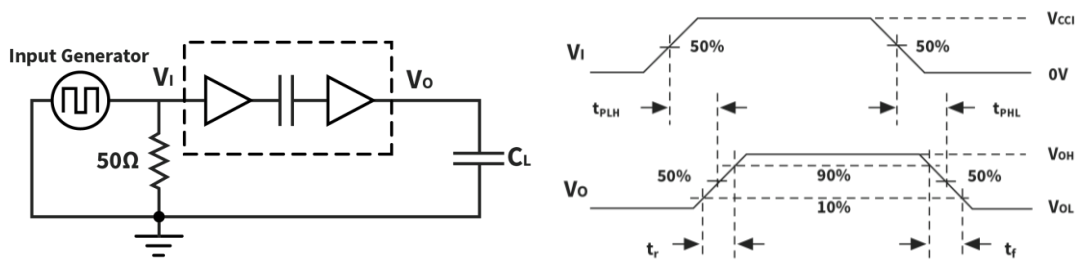


Figure 5.5 Switching Characteristics Test Circuit and Waveform

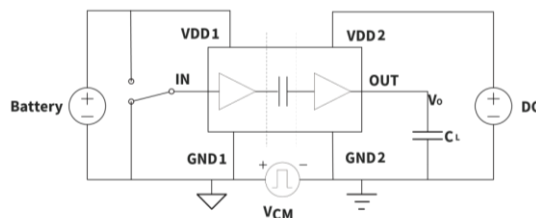


Figure 5.6 Common-Mode Transient Immunity Test Circuit

6. High Voltage Feature Description

6.1. Insulation and Safety Related Specifications

Description	Test Condition	Symbol	Value		Unit
			SSOP16	SOP16 (300mil)	
Min. External Air Gap (Clearance)		CLR	3.9	8	mm
Min. External Tracking (Creepage)		CPG	3.9	8	mm
Distance through the Insulation		DTI	28		um
Comparative Tracking Index	DIN EN 60112 (VDE 0303-11)	CTI	>600		V
Material Group	IEC 60112		I		
Installation Classification per DIN VDE 0110					
For Rated Mains Voltage ≤ 150Vrms			I to III	I to IV	
For Rated Mains Voltage ≤ 300Vrms			I to II	I to IV	
For Rated Mains Voltage ≤ 600Vrms			I	I to IV	
For Rated Mains Voltage ≤ 1000Vrms			/	I to III	
Insulation Specification per DIN VDE V 0884-11:2017-01 ¹⁾					
Climatic Category			40/125/21		
Pollution Degree	per DIN VDE 0110, Table 1		2		
Maximum Working Isolation Voltage	AC voltage	V_{IOWM}	400	1500	V_{RMS}
	DC voltage		565	2121	V_{DC}
Maximum Repetitive Isolation Voltage		V_{IORM}	565	2121	V_{peak}
Input to Output Test Voltage, Method B1	$V_{ini. b} = V_{IOTM}, V_{pd(m)} = V_{IORM} \times 1.5,$ $t_{ini} = t_m = 1 \text{ sec}, q_{pd} \leq 5 \text{ pC},$ 100% production test	$V_{pd(m)}$	847	/	V_{peak}
	$V_{ini. b} = V_{IOTM}, V_{pd(m)} = V_{IORM} \times 1.875,$ $t_{ini} = t_m = 1 \text{ sec}, q_{pd} \leq 5 \text{ pC},$ 100% production test	$V_{pd(m)}$	/	3977	V_{peak}
	$V_{ini. a} = V_{IOTM}, V_{pd(m)} = V_{IORM} \times 1.3,$ $t_{ini} = 60 \text{ sec}, t_m = 10 \text{ sec}, q_{pd} \leq 5 \text{ pC}$	$V_{pd(m)}$	678	/	V_{peak}

Description	Test Condition	Symbol	Value		Unit
Input to Output Test Voltage, Method A. After Environmental Tests Subgroup 1	$V_{ini.a} = V_{IOTM}, V_{pd(m)} = V_{IORM} \times 1.6,$ $t_{ini} = 60 \text{ sec}, t_m = 10 \text{ sec}, q_{pd} \leq 5 \text{ pC}$	$V_{pd(m)}$	/	3394	V_{peak}
Input to Output Test Voltage, Method A. After Input and Output Safety Test Subgroup 2 and Subgroup 3	$V_{ini.a} = V_{IOTM}, V_{pd(m)} = V_{IORM} \times 1.2,$ $t_{ini} = 60 \text{ sec}, t_m = 10 \text{ sec}, q_{pd} \leq 5 \text{ pC}$	$V_{pd(m)}$	678	2545	V_{peak}
Maximum Transient Isolation Voltage	$t = 60 \text{ sec}$	V_{IOTM}	3000	8000	V_{peak}
Maximum Surge Isolation Voltage	Test method per IEC62368-1, 1.2/50us waveform, $V_{TEST} = 1.3 \times V_{IOSM}$	V_{IOSM}	4500	/	V_{peak}
	Test method per IEC62368-1, 1.2/50us waveform, $V_{TEST} = 1.6 \times V_{IOSM}$		/	6250	V_{peak}
Isolation Resistance	$V_{IO} = 500 \text{ V}, T_{amb} = T_S$	R_{IO}	$>10^9$		Ω
	$V_{IO} = 500 \text{ V}, 100 \text{ }^\circ\text{C} \leq T_{amb} \leq 125 \text{ }^\circ\text{C}$		$>10^{11}$		Ω
Isolation Capacitance	$f = 1\text{MHz}$	C_{IO}	1.2		pF
Insulation Specification per UL1577					
Withstand Isolation Voltage	$V_{TEST} = 1.2 \times V_{ISO}, t = 1 \text{ sec},$ 100% production test	V_{ISO}	3000	5000	V_{rms}

6.2. Safety-Limiting Values

Reinforced isolation safety-limiting values as outlined in VDE-0884-11 of NSI8266-DSWR

Description	Test Condition	Value		Unit
Safety Supply Power	$R_{\theta JA} = 60.3 \text{ }^\circ\text{C/W}, T_J = 150 \text{ }^\circ\text{C}, T_A = 25 \text{ }^\circ\text{C}$	2073	mW	
Safety Supply Current	$R_{\theta JA} = 60.3 \text{ }^\circ\text{C/W}, V_I = 5\text{V}, T_J = 150 \text{ }^\circ\text{C}, T_A = 25 \text{ }^\circ\text{C}$	414	mA	
Safety Temperature ²⁾		150	$^\circ\text{C}$	

1) Calculate with the junction-to-air thermal resistance, $R_{\theta JA}$, of SOP16(300mil) 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 6.1 NSI826x-DSWR Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN VDE V 0884-11

Basic isolation safety-limiting values as outlined in VDE-0884-11 of NSI8266-DSSR

Description	Test Condition	Value		Unit
Safety Supply Power	$R_{\theta JA} = 86.5 \text{ }^\circ\text{C/W}, T_J = 150 \text{ }^\circ\text{C}, T_A = 25 \text{ }^\circ\text{C}$	1445	mW	

Description	Test Condition	Value	Unit
Safety Supply Current	$R_{\theta JA} = 86.5 \text{ }^\circ\text{C/W}$, $V_I = 5\text{V}$, $T_J = 150 \text{ }^\circ\text{C}$, $T_A = 25 \text{ }^\circ\text{C}$	289	mA
Safety Temperature ²⁾		150	$^\circ\text{C}$

- 1) Calculate with the junction-to-air thermal resistance, $R_{\theta JA}$, of SSOP16 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.

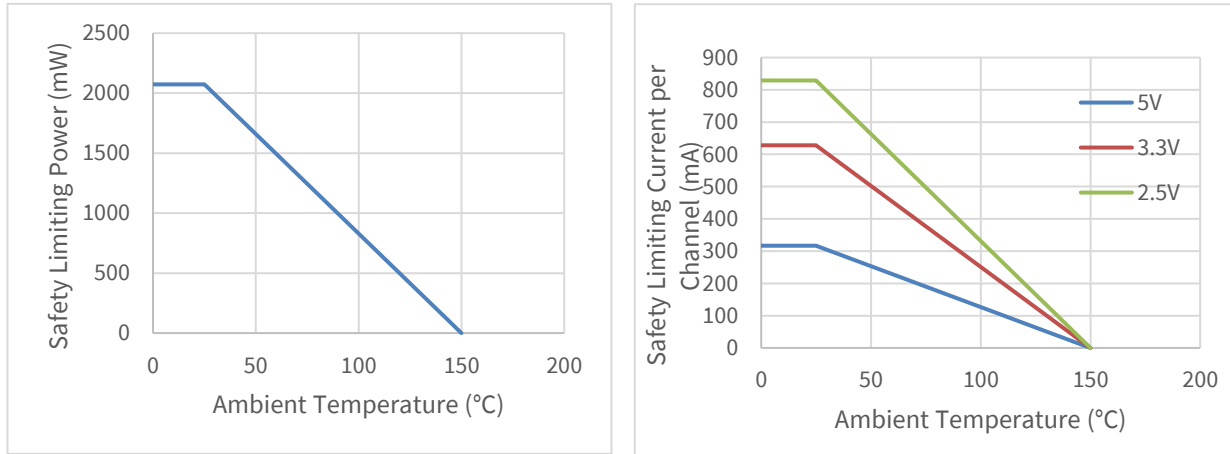


Figure 6.1 NSI8266-DSSR Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN VDE V 0884-11

6.3. Regulatory Information

The NSI8266W0-DSWR are approved or pending approval by the organizations listed in table.

CUL	VDE	CQC
UL 1577 Component Recognition Program ¹	Approved under CSA Component Acceptance Notice 5A	DIN VDE V 0884-11(VDE V 0884-11):2017-01 ²
Certified by CQC11-471543-2012 GB4943.1-2011	Reinforce Insulation 2121Vpeak, $V_{IOSM}=6250\text{Vpeak}$	Reinforced insulation at 1500V _{RMS} (2121Vpeak)
Single Protection, 5000V _{rms} Isolation voltage	File (pending)	File (pending)
File (pending)	File (5024579-4880-0002 / 276211)	File (pending)

The NSi8266S0-DSSR are approved or pending approval by the organizations listed in table.

<i>CUL</i>		<i>VDE</i>	<i>CQC</i>
UL 1577 Component Recognition Program ¹	Approved under CSA Component Acceptance Notice 5A	DIN VDE V 0884-11(VDE V 0884-11):2017-01 ²	Certified by CQC11-471543-2012 GB4943.1-2011
Single Protection, 3000V _{rms} Isolation voltage	Single Protection, 3000V _{rms} Isolation voltage	Basic Insulation 565V _{peak} , VIOSM=5384V _{peak}	Basic insulation at 400V _{rms} (565V _{peak})
File (pending)	File (pending)	File (pending)	File (pending)

7. Function Description

7.1. Overview

NSi8266 is high reliability six-channel digital isolator. NSi8266 is safety certified by UL1577 support 5kV_{rms} insulation withstand voltages, while providing high electromagnetic immunity and low emissions at low power consumption. The data rate is up to 100Mbps, and the common-mode transient immunity (CMTI) is up to 100kV/us. NSi8266’s default output is low when input power is lost to prevent IPM switching during power on stage. Wide supply voltage of NSi8266 support to connect with most digital interface directly, easy to do the level shift. High system level EMC performance enhance reliability and stability of use.

NSi8266 has a default output status when VDDIN is unready and VDDOUT is ready as shown in Table 7.1, which helps for diagnosis when power is missing at the transmitter side. The other outputs follow the same status with the input A after powering up respectively.

Table 7.1 Output status vs. power status

<i>XH_IN</i>	<i>XL_IN</i>	<i>VDD1 status</i>	<i>VDD2 status</i>	<i>XH_OUT</i>	<i>XL_OUT</i>	<i>Comment</i>
H	H	Ready	Ready	L	L	Normal operation.
L or NC	H	Ready	Ready	L	H	
H	L or NC	Ready	Ready	H	L	
L or NC	L or NC	Ready	Ready	L	L	
X	X	Unready	Ready	L	L	The output follows the Normal operation after input side VDD1 is powered on.
X	X	Ready	Unready	X	X	The output follows the Normal operation after output side VDD2 is powered on.

Note: H=Logic high; L=Logic low; X=Logic low or logic high
VDD1 is input side power; VDD2 is outside power.

7.2. OOK Modulation

NSi8266 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 Fig7.1, 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.

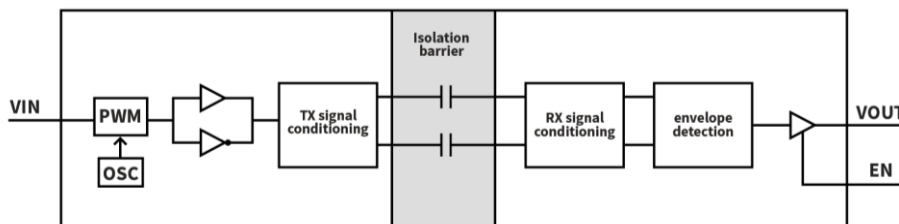


Figure 7.1 Single Channel Function Block Diagram

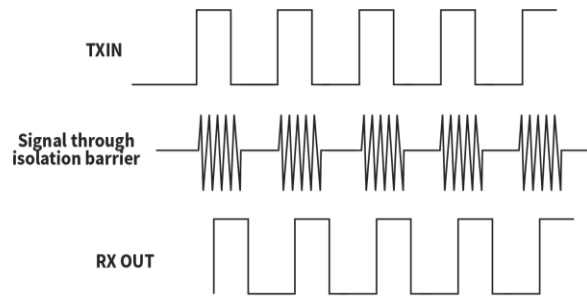


Figure 7.2 OOK Modulation

7.3. Shoot Through Protection

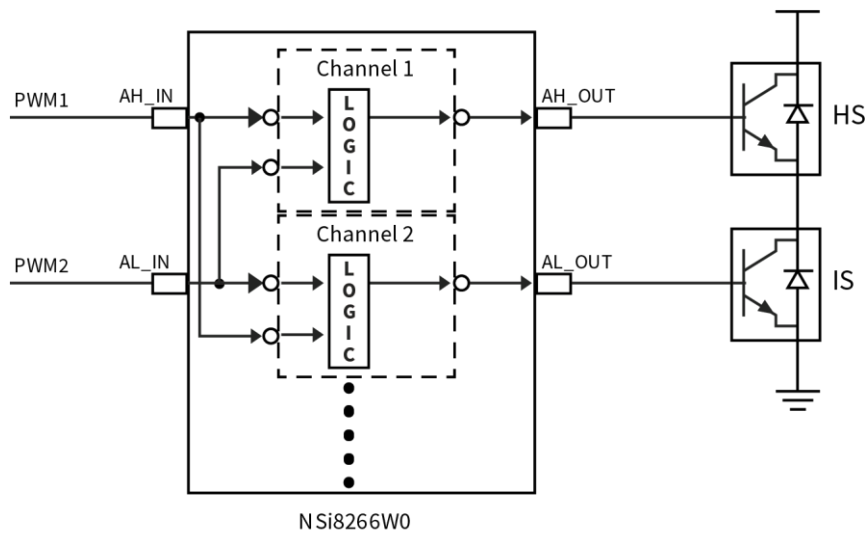


Figure 7.3 Typical IPM isolated driving Circuit

As shown in Fig. 7.3, NSi8266 has the interlock function to provide the shoot through protection to prevent both high-side and low-side switches to be activated simultaneously, if one of the adjacent channels is in ON state, the counterpart PWM signal is inhibited, preventing it to turn high. Fig. 7.4 & Fig.7.5 show the test waveform.

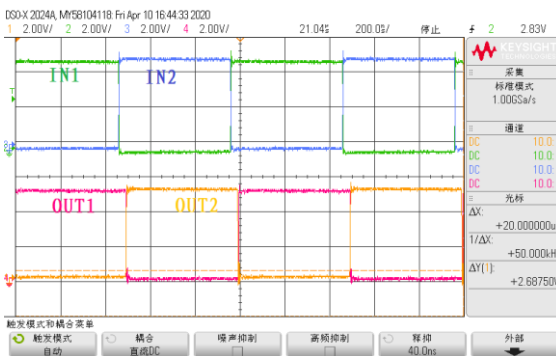


Figure 7.4 NSi8266 normal driving signal waveform

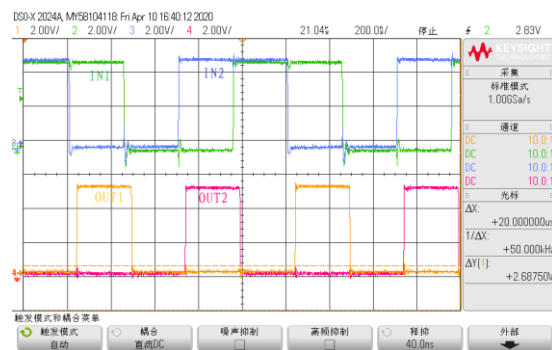


Figure 7.5 NSi8266 driving signal with interlock triggered

8. Application Note

8.1. Typical Application Circuit

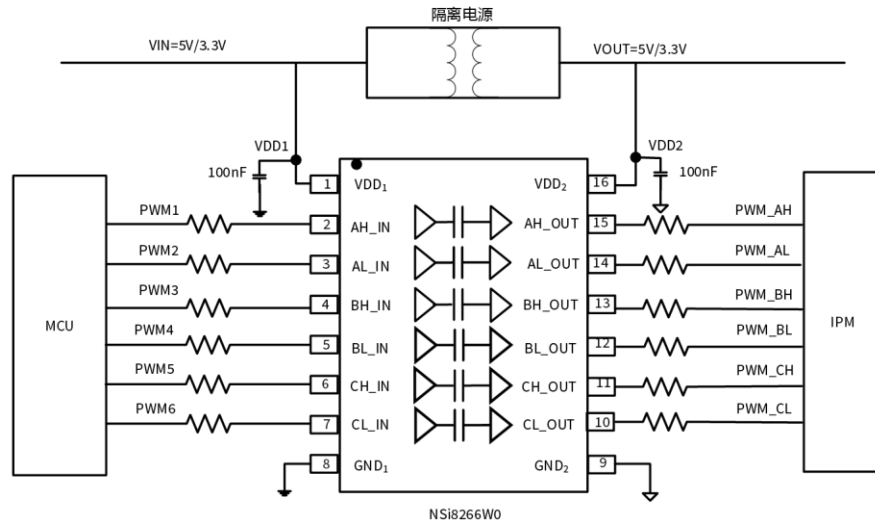


Figure 8.1 Typical IPM isolated driving Circuit

8.2. PCB Layout

NSi8266 requires a 0.1 μF bypass capacitor between VDD1 and GND1, VDD2 and GND2. The capacitor should be placed as close as possible to the package. Figure 5.1 to Figure 5.2 show the recommended PCB layout, 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 Ω , $\pm 40\%$. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.

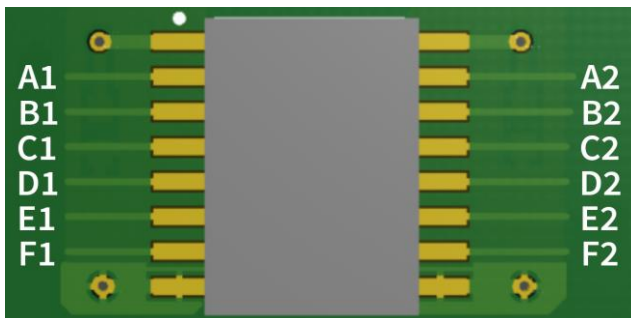
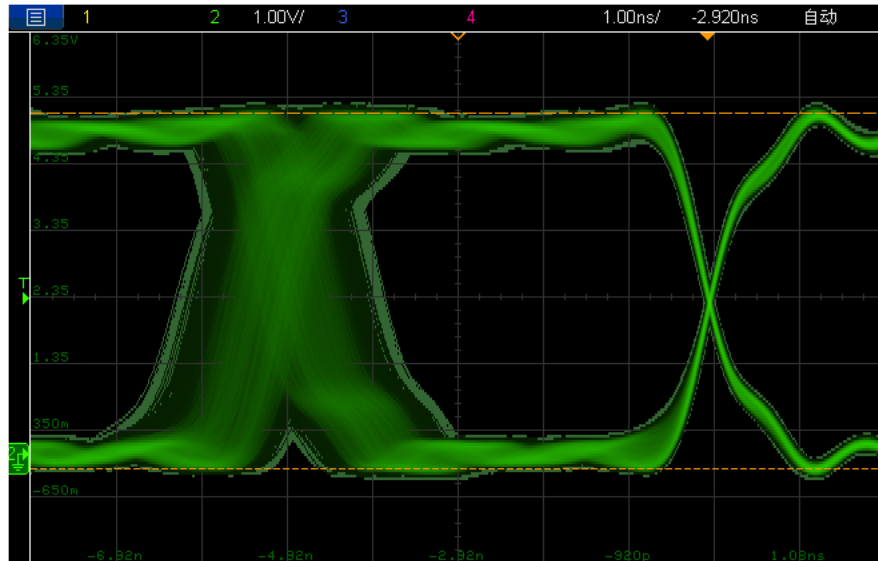


Figure8.2 Recommended PCB Layout — Top Layer



Figure8.3 Recommended PCB Layout — Bottom Layer

8.3. High Speed Performance



8.4. Typical Supply Current Equations

The typical supply current of NSi8266 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

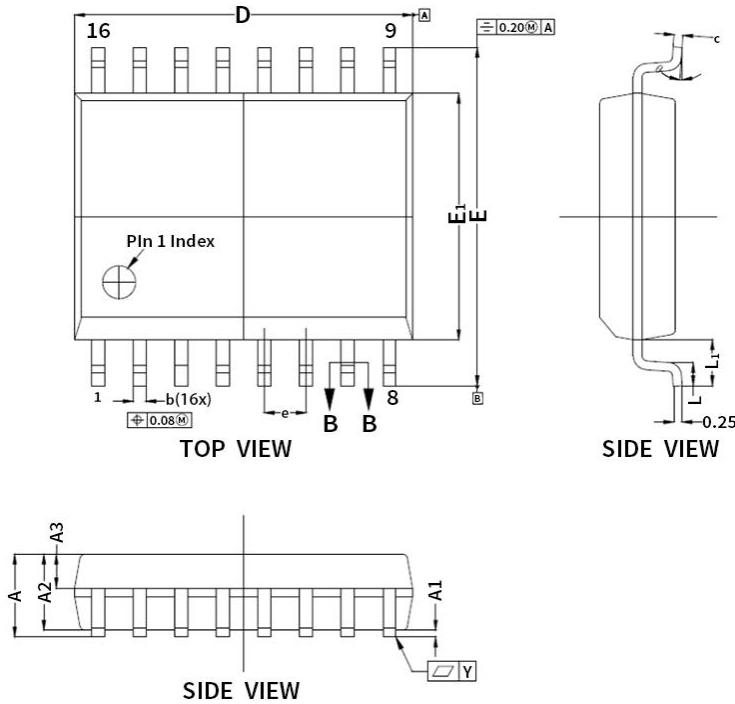
NSi8266:

$$I_{DD1} = 0.22 * a1 + 1.2 * b1 + 0.7 * c1.$$

$$I_{DD2} = 3.3 + VDD1 * f * C_L * c1 * 10^{-9}$$

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

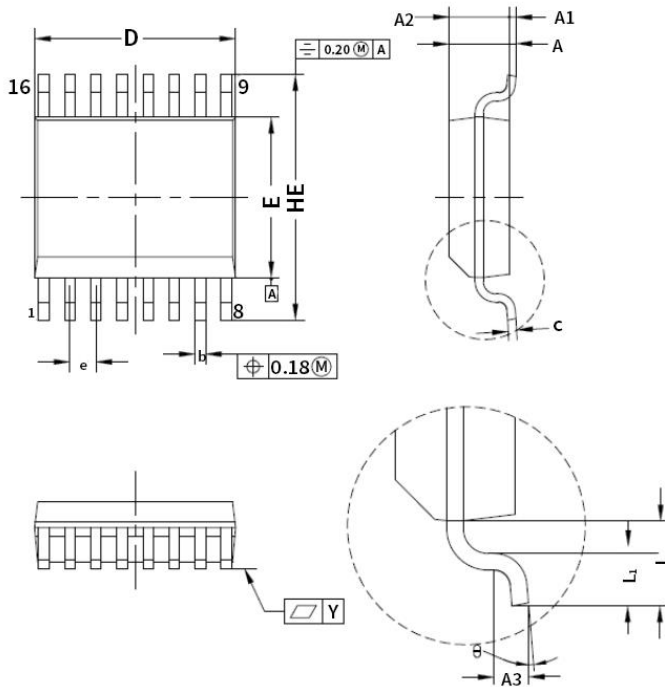
9. Package Information



* CONTROLLING DIMENSION:MM

SYMBOL	MILLIMETER		
	MIN.	NOM.	MAX.
A	---	---	2.65
A1	0.10	---	0.30
A2	2.25	2.30	2.35
A3	0.97	1.02	1.07
b	0.35	---	0.43
c	0.23	---	0.32
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°

Figure 9.1 SOP16(300mil) Package Shape and Dimension in millimeters



* CONTROLLING DIMENSION:MM

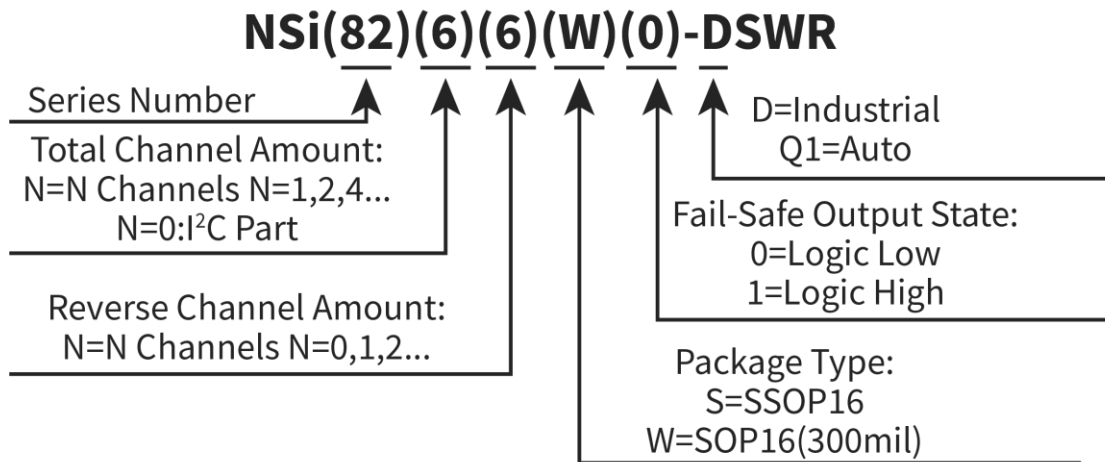
SYMBOL	MILLIMETER			INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	---	---	1.73	---	---	0.068
A1	0.10	---	0.25	0.004	---	0.010
A2	1.40	---	1.55	0.055	---	0.061
b	0.20	---	0.31	0.008	---	0.012
c	0.18	---	0.25	0.007	---	0.010
D	4.80	---	5.00	0.189	---	0.197
E	3.80	---	4.00	0.150	---	0.157
HE	5.80	---	6.20	0.228	---	0.244
e	0.635 bsc			0.025 bsc		
L	1.00 bsc			0.039 bsc		
L1	0.41	---	0.89	0.016	---	0.035
Y	---	0.09	---	---	0.004	---
A3	---	0.25	---	---	0.010	---
θ	0°	---	8°	0°	---	8°

Figure 9.2 SSOP16 Package Shape and Dimension in millimeters

10. Ordering 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
NSI8266W0-DSWR	5	6	0	150	Low	-40 to 125°C	2	SOP16 (300mil)	SOW16	1000
NSI8266S0-DSSR	3	6	0	150	Low	-40 to 125°C	1	SSOP16	SSOP16	2500

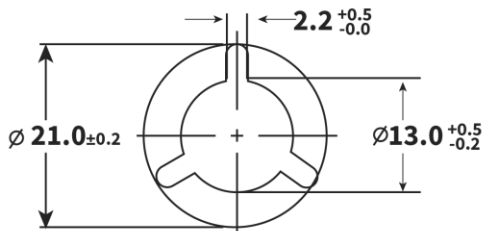
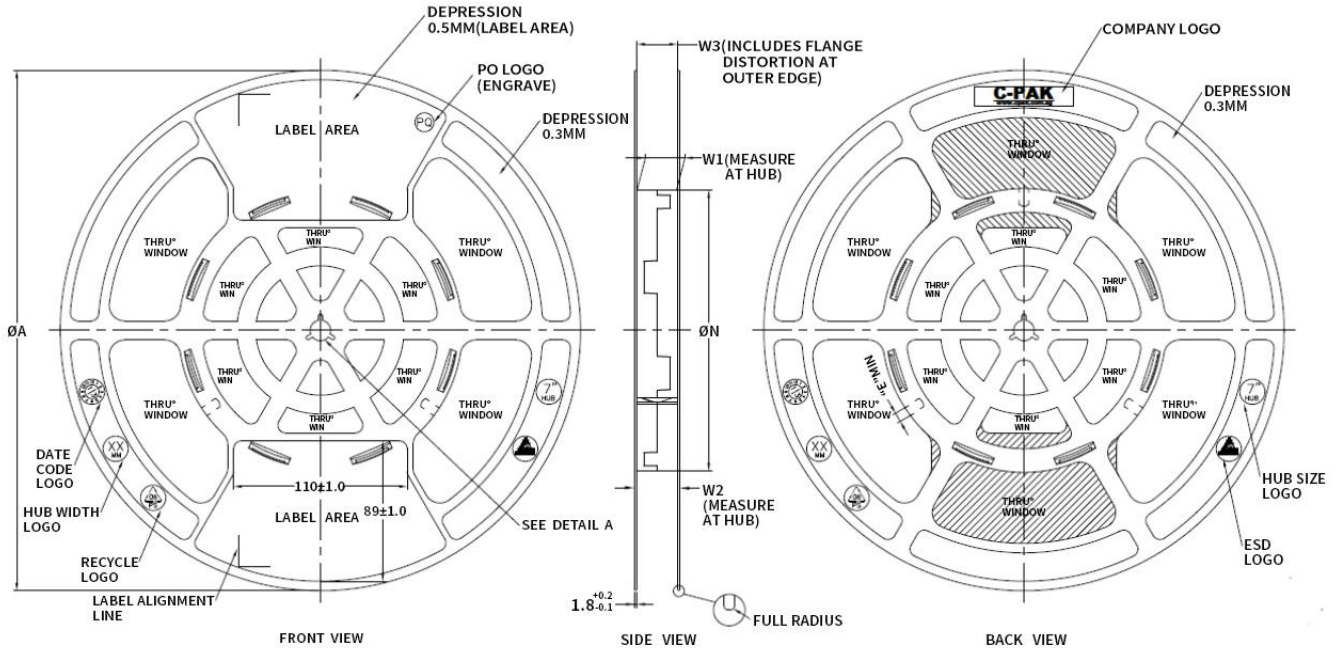
Part Number Rule:



11. Documentation Support

Part Number	Product Folder	Datasheet	Technical Documents	Isolator selection guide
NSI8266	tbd	tbd	tbd	tbd

12. Tape and Reel Information

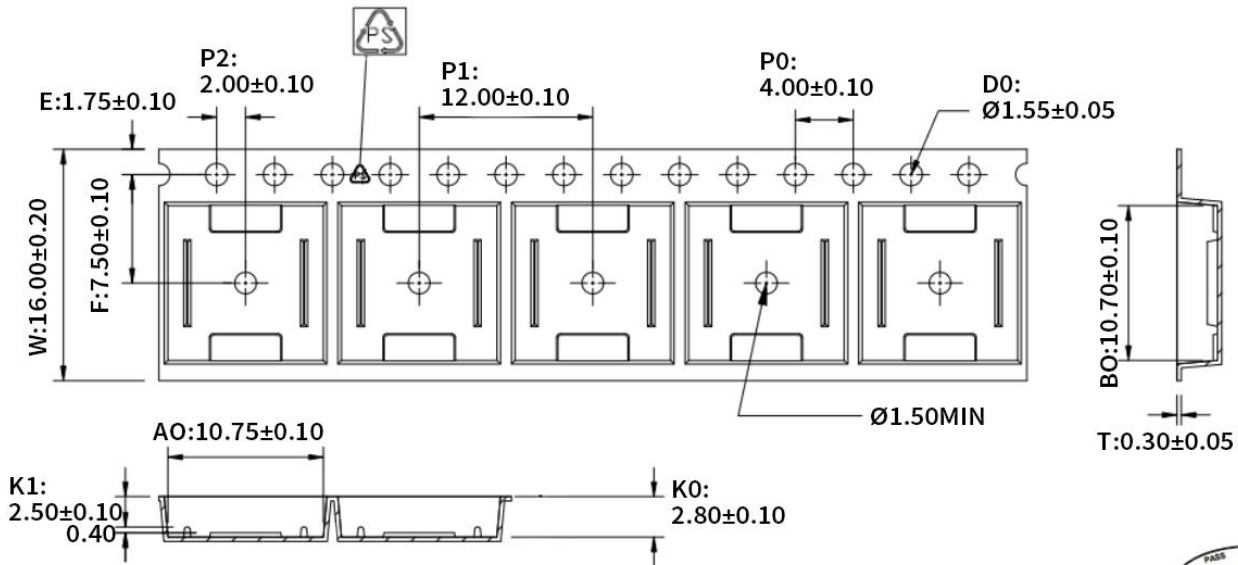


**ARBOR HOLE
DETAIL A
SCALE: 3:1**

PRODUCT SPECIFICATION						
TAPE WIDTH	$\varnothing A \pm 2.0$	$\varnothing N \pm 2.0$	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

Figure 12.1 Reel Information (for all packages)



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 ± 0.05 mm.
6. Packing length per 22" reel: 378 Meters. (Rewind N=122)
7. Component load per 13" reel: 1000 pcs.
8. Surface resistivity: $10^5 \sim 10^{10} \Omega/\square$

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

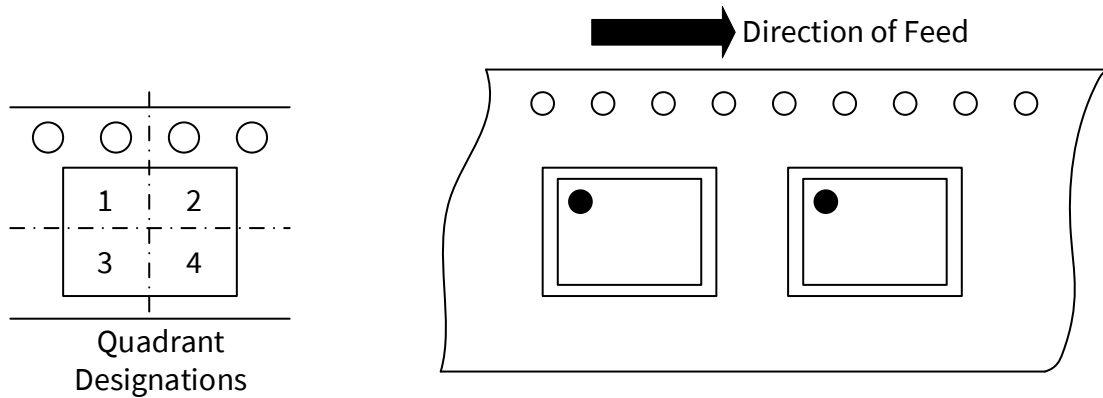


Figure 12.2 Tape Information of SOP16(300mil)

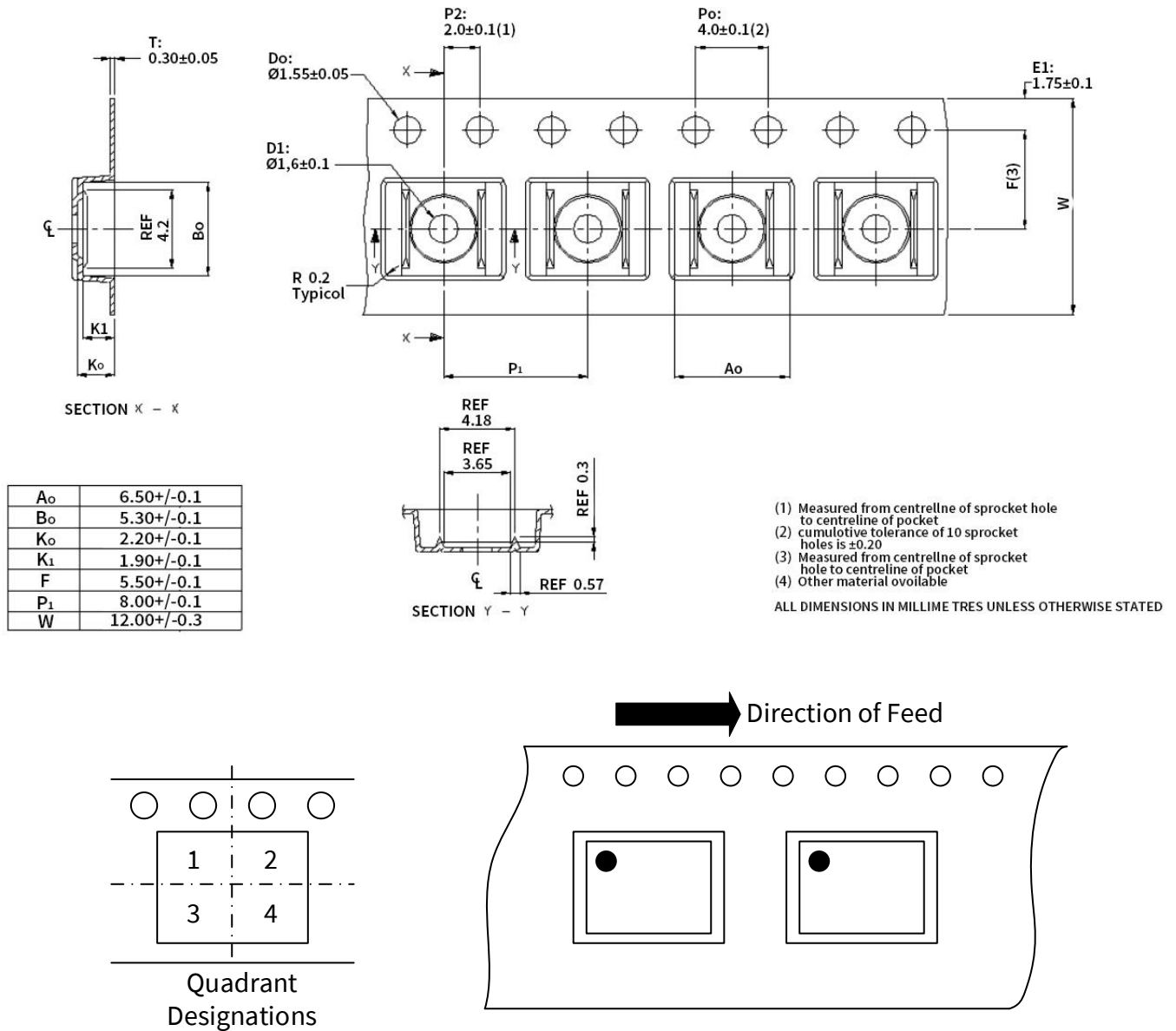


Figure 12.3 Tape Information of SSOP16(150mil)

13. Revision History

Revision	Description	Date
1.0	Initial version	2020/11/20
1.1	Changed tape and reel information	2020/12/20
1.2	Delete Isolation barrier life: >60 years, add Tj, update SOW16 package information, change DTI to 28, update safety-limiting values curve	2022/9/29

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as any warranty or authorization of, express or implied, including but not limited to accuracy, completeness, merchantability, fitness for a particular purpose or infringement of any third party's intellectual property rights.

You are solely responsible for your use of Novosense' products and applications, and for the safety thereof. You shall comply with all laws, regulations and requirements related to Novosense's products and applications, although information or support related to any application may still be provided by Novosense.

The resources are intended only for skilled developers designing with Novosense' products. Novosense reserves the rights to make corrections, modifications, enhancements, improvements or other changes to the products and services provided. Novosense authorizes you to use these resources exclusively for the development of relevant applications designed to integrate Novosense's products. Using these resources for any other purpose, or any unauthorized reproduction or display of these resources is strictly prohibited. Novosense shall not be liable for any claims, damages, costs, losses or liabilities arising out of the use of these resources.

For further information on applications, products and technologies, please contact Novosense (www.novosns.com).

Suzhou Novosense Microelectronics Co., Ltd