## Product Overview

The NSi822x devices are high reliability dual-channel digital isolators. The NSi822x device is safety certified by UL1577 support several insulation withstand voltages (3.75kVrms, 5kVrms, 8kVrms), while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of the NSi822x is up to 150Mbps, and the common-mode transient immunity (CMTI) is up to 250kV/us. The NSi822x device provides digital channel direction configuration and the default output level configuration when the input power is lost. Wide supply voltage of the NSi822x device 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.

## Key Features

- Up to 5000$V_{rms}$ Insulation voltage
- Date rate: DC to 150Mbps
- Power supply voltage: 2.5V to 5.5V
- High CMTI: 250kV/us
- Chip level ESD: HBM: ±8kV
- Robust EMC Reinforced Dual-Channel Digital Isolators for SOW8 wide body and SOW16 wide body
- Default output high level or low level option
- Isolation surge voltage: >10kV
- Low power consumption: 1.5mA/ch (1 Mbps)
- Low propagation delay: <15ns
- Operation temperature: -55℃~125℃
- RoHS-compliant packages:
    - SOP8 narrow body
    - SOW8 wide body
    - SOW16 wide body
    - SOWW16 wide body

## Safety Regulatory Approvals

- UL recognition: up to 5000$V_{rms}$ for 1 minute per UL1577

- CQC certification per GB4943.1-2011
- CSA component notice 5A
- 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 |
|---|---|---|
| NSi822xNx-DSPR | SOP8 | 4.90mm × 3.90mm |
| NSi822xWx-DSWVR | SOW8 | 5.85mm × 7.50mm |
| NSi822xWx-DSWR | SOW16 | 10.30mm × 7.50mm |
| NSi822xWx-DSWWR | SOWW16 | 10.52mm × 14.0mm |

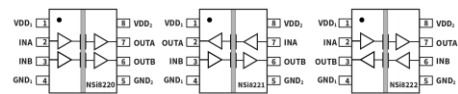## Functional Block Diagrams


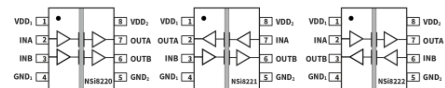
Figure 1. NSi822xN Block Diagram
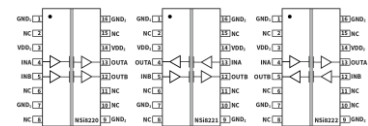


Figure 2. NSi822xW SOW8 Block Diagram



Figure 3. NSi822xW SOW16 Block Diagram
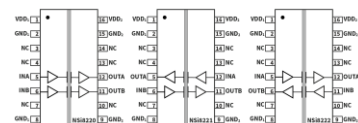


Figure 4. NSi822xW SOWW16 Block Diagram

## INDEX

# 1. Pin Configuration and Functions



Figure 1.1 NSi8220N Package
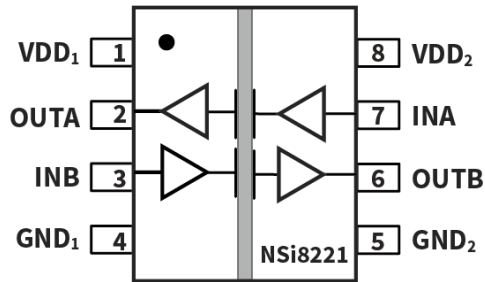


Figure 1.2 NSi8221N Package
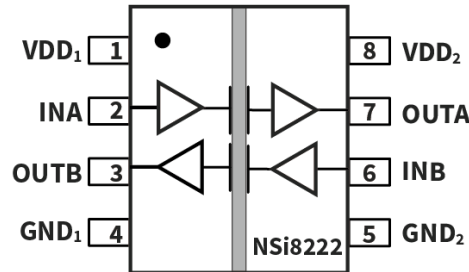


Figure 1.3 NSi8222N Package

Table1.1 NSi8220N/ NSi8221N/ NSi8222N Pin Configuration and Description

| NSi8220N PIN NO. | NSi8221N PIN NO. | NSi8222N PIN NO. | SYMBOL | FUNCTION |
|---|---|---|---|---|
| 1 | 1 | 1 | VDD1 | Power Supply for Isolator Side 1 |
| 2 | 7 | 2 | INA | Logic Input A |
| 3 | 3 | 6 | INB | Logic Input B |
| 4 | 4 | 4 | GND1 | Ground 1, the ground reference for Isolator Side 1 |
| 5 | 5 | 5 | GND2 | Ground 2, the ground reference for Isolator Side 2 |
| 6 | 6 | 3 | OUTB | Logic Output B |
| 7 | 2 | 7 | OUTA | Logic Output A |
| 8 | 8 | 8 | VDD2 | Power Supply for Isolator Side 2 |

Figure 1.4 NSi8220Wx SOW8 Package



Figure 1.5 NSi8221Wx SOW8 Package



Figure 1.6 NSi8222Wx SOW8 Package

Table1.2 NSi8220W/ NSi8221W/ NSi8222W SOW8 Pin Configuration and Description

| NSi8220W SOW8 PIN NO. | NSi8221W SOW8 PIN NO. | NSi8222W SOW8 PIN NO. | SYMBOL | FUNCTION |
|---|---|---|---|---|
| 1 | 1 | 1 | VDD1 | Power Supply for Isolator Side 1 |
| 2 | 7 | 2 | INA | Logic Input A |
| 3 | 3 | 6 | INB | Logic Input B |
| 4 | 4 | 4 | GND1 | Ground 1, the ground reference for Isolator Side 1 |
| 5 | 5 | 5 | GND2 | Ground 2, the ground reference for Isolator Side 2 |
| 6 | 6 | 3 | OUTB | Logic Output B |
| 7 | 2 | 7 | OUTA | Logic Output A |
| 8 | 8 | 8 | VDD2 | Power Supply for Isolator Side 2 |

Figure 1.7 NSi8220W SOW16 Package
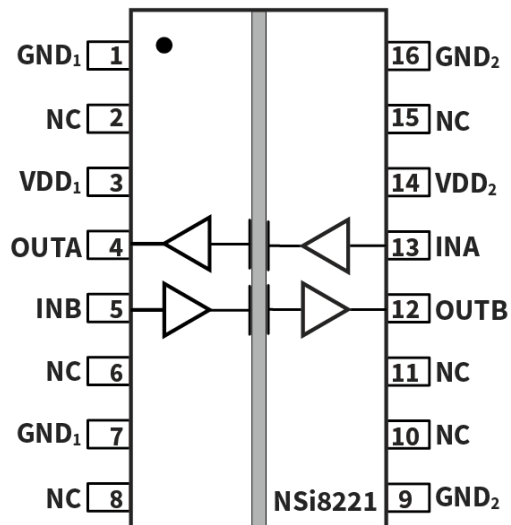
Figure 1.8 NSi8221W SOW16 Package
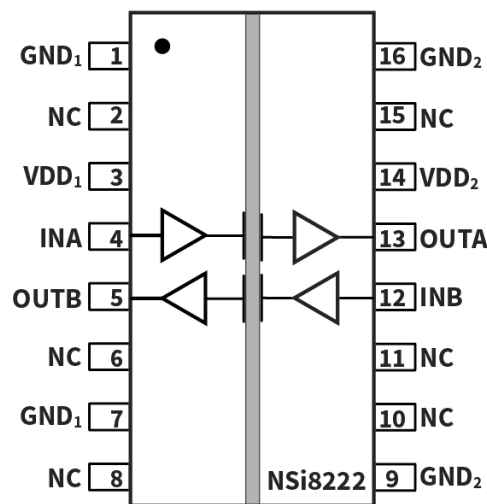
Figure 1.9 NSi8222W SOW16 Package

Table 1.3 NSi8220W/ NSi8221W/ NSi8222W SOW16 Pin Configuration and Description

| NSi8220W SOW16 PIN NO. | NSi8221W SOW16 PIN NO. | NSi8222W SOW16 PIN NO. | SYMBOL | FUNCTION |
|---|---|---|---|---|
| 1 | 1 | 1 | GND1 | Ground 1, the ground reference for Isolator Side 1 |
| 2 | 2 | 2 | NC | No Connection. |
| 3 | 3 | 3 | VDD1 | Power Supply for Isolator Side 1 |

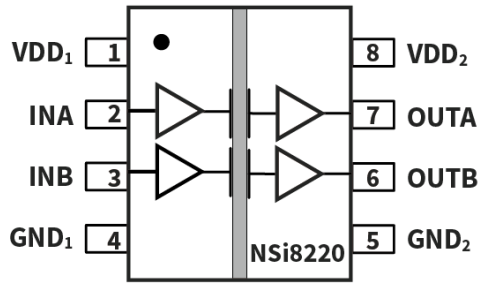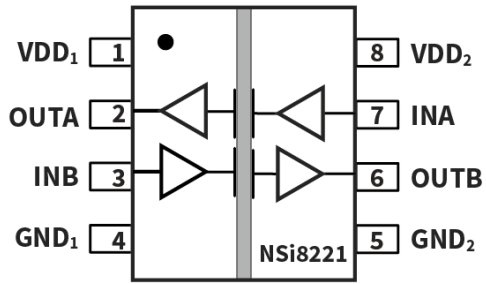| NSi8220W SOW16 PIN NO. | NSi8221W SOW16 PIN NO. | NSi8222W SOW16 PIN NO. | SYMBOL | FUNCTION |
|---|---|---|---|---|
| 4 | 13 | 4 | INA | Logic Input A |
| 5 | 5 | 12 | INB | Logic Input B |
| 6 | 6 | 6 | NC | No Connection. |
| 7 | 7 | 7 | GND1 | Ground 1, the ground reference for Isolator Side 1 |
| 8 | 8 | 8 | NC | No Connection. |
| 9 | 9 | 9 | GND2 | Ground 2, the ground reference for Isolator Side 2 |
| 10 | 10 | 10 | NC | No Connection. |
| 11 | 11 | 11 | NC | No Connection. |
| 12 | 12 | 5 | OUTB | Logic Output B |
| 13 | 4 | 13 | OUTA | Logic Output A |
| 14 | 14 | 14 | VDD2 | Power Supply for Isolator Side 2 |
| 15 | 15 | 15 | NC | No Connection. |
| 16 | 16 | 16 | GND2 | Ground 2, the ground reference for Isolator Side 2 |
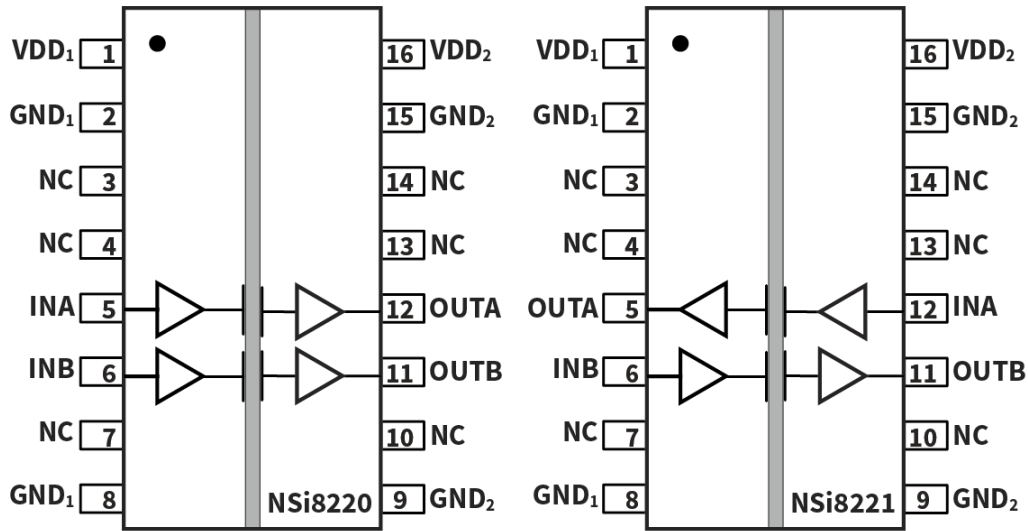
Figure 1.10 NSi8220W SOWW16 Package
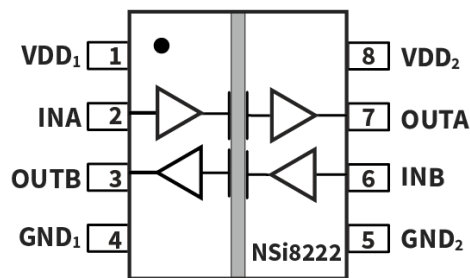


Figure 1.11 NSi8221W SOWW16 Package
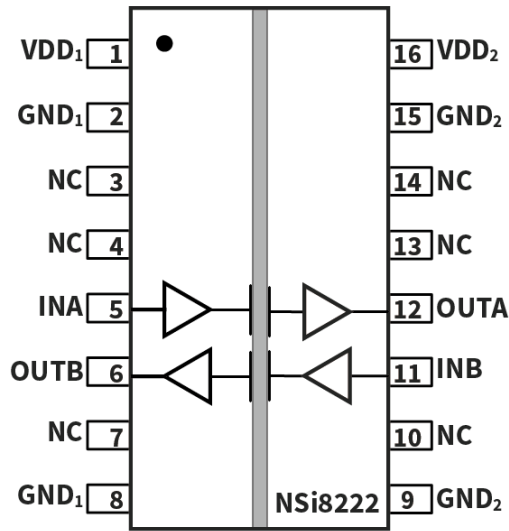


Figure 1.12 NSi8222W SOWW16 Package

Table 1.4 NSi8220W/ NSi8221W/ NSi8222W SOWW16 Pin Configuration and Description

| NSi8220W SOWW16 PIN NO. | NSi8221W SOWW16 PIN NO. | NSi8222W SOWW16 PIN NO. | SYMBOL | FUNCTION |
|---|---|---|---|---|
| 1 | 1 | 1 | VDD1 | Power Supply for Isolator Side 1 |
| 2 | 2 | 2 | GND1 | Ground 1, the ground reference for Isolator Side 1 |
| 3 | 3 | 3 | NC | No Connection. |

| NSi8220W SOWW16 PIN NO. | NSi8221W SOWW16 PIN NO. | NSi8222W SOWW16 PIN NO. | SYMBOL | FUNCTION |
|---|---|---|---|---|
| 4 | 4 | 4 | NC | No Connection. |
| 5 | 12 | 5 | INA | Logic Input A |
| 6 | 6 | 11 | INB | Logic Input B |
| 7 | 7 | 7 | NC | No Connection. |
| 8 | 8 | 8 | GND1 | Ground 1, the ground reference for Isolator Side 1 |
| 9 | 9 | 9 | GND2 | Ground 2, the ground reference for Isolator Side 2 |
| 10 | 10 | 10 | NC | No Connection. |
| 11 | 11 | 6 | OUTB | Logic Output B |
| 12 | 5 | 12 | OUTA | Logic Output A |
| 13 | 13 | 13 | NC | No Connection. |
| 14 | 14 | 14 | NC | No Connection. |
| 15 | 15 | 15 | GND2 | Ground 2, the ground reference for Isolator Side 2 |
| 16 | 16 | 16 | VDD2 | 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 | $V_{INA}$, $V_{INB}$ | -0.4 | | VDD+0.4 | V | The maximum voltage must not exceed 6.5V |
| Maximum Output Voltage | $V_{OUTA}$, $V_{OUTB}$ | -0.4 | | VDD+0.4 | V | The maximum voltage must not exceed 6.5V |
| Maximum Input/Output Pulse Voltage | $V_{INA}$, $V_{INB}$, $V_{OUTA}$, $V_{OUTB}$ | -0.8 | | VDD+0.8 | V | Pulse width should be less than 100ns, and the duty cycle should be less than 10% |
| Output current | Io | -15 | | 15 | mA | |
| Operating Temperature | Topr | -55 | | 125 | ℃ | |
| Junction Temperature | Tj | | | 150 | ℃ | |
| Storage Temperature | Tstg | -65 | | 150 | ℃ | |
| Electrostatic discharge | HBM | | | ±8000 | V | |
| | CDM | | | ±2000 | V | |

## 3. Recommended Operating Conditions

| Parameters | Symbol | min | typ | max | unit |
|---|---|---|---|---|---|
| Power Supply Voltage | VDD1, VDD2 | 2.5 | | 5.5 | V |
| Operating Temperature | Topr | -55 | | 125 | ℃ |
| High Level Input Voltage | VIH | 2 | | | V |
| Low Level Input Voltage | VIL | | | 0.8 | V |
| Data rate | DR | | | 150 | Mbps |

# 4. Thermal Characteristics

| Parameters | Symbol | SOWW16 | SOW16 | SOW8 | SOP8 | Unit |
|---|---|---|---|---|---|---|
| IC Junction-to-Air Thermal Resistance | $\theta_{JA}$ | 86.5 | 86.5 | 84.3 | 137.7 | ℃/W |
| Junction-to-case (top) thermal resistance | $\theta_{JC(top)}$ | 49.6 | 49.6 | 36.3 | 54.9 | ℃/W |
| Junction-to-board thermal resistance | $\theta_{JB}$ | 49.7 | 49.7 | 47.0 | 71.7 | ℃/W |

# 5. Specifications

## 5.1. Electrical Characteristics

(VDD1=2.5V~5.5V, VDD2=2.5V~5.5V, Ta=-55℃ to 125℃. Unless otherwise noted, Typical values are at VDD1 = 5V, VDD2 = 5V, Ta = 25℃)

| 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 |
| 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 | $I_{OH} \leq 4mA$ |
| Low Level Output Voltage | $V_{OL}$ | | | 0.4 | V | $I_{OL} \leq 4mA$ |
| Output Impedance | $R_{out}$ | | 50 | | ohm | |
| Input Pull high or low Current | $I_{pull}$ | | 8 | 15 | uA | |
| Start Up Time after POR | trbs | | 10 | | usec | |
| Common Mode Transient Immunity | CMTI | ±200 | ±250 | | kV/us | See Figure 5.8 |

## 5.2. Supply Current Characteristics – 5V Supply

(VDD1=5V± 10%, VDD2=5V± 10%, Ta=-55℃ to 125℃. Unless otherwise noted, Typical values are at **VDD1 = 5V, VDD2 = 5V,** Ta = 25℃)

| Parameters | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| | **NSi8220** | | | | | |
| | $I_{DD1}(Q0)$ | | 0.59 | 0.89 | mA | All Input 0V for NSi8220x0 Or All Input at supply for NSi8220x1 |
| | $I_{DD2}(Q0)$ | | 1.29 | 1.94 | mA | |
| | $I_{DD1}(Q1)$ | | 2.80 | 4.20 | mA | All Input at supply for NSi8220x0 Or All Input 0V for NSi8220x1 |
| | $I_{DD2}(Q1)$ | | 1.32 | 1.98 | mA | |
| | $I_{DD1}(1M)$ | | 1.70 | 2.55 | mA | All Input with 1Mbps, $C_L$=15pF |
| | $I_{DD2}(1M)$ | | 1.39 | 2.09 | mA | |
| | $I_{DD1}(10M)$ | | 1.78 | 2.67 | mA | All Input with 10Mbps, $C_L$=15pF |
| | $I_{DD2}(10M)$ | | 2.13 | 3.20 | mA | |
| | $I_{DD1}(100M)$ | | 2.49 | 4.23 | mA | All Input with 100Mbps, $C_L$=15pF |
| | $I_{DD2}(100M)$ | | 9.22 | 15.66 | mA | |
| Supply current | **NSi8221/ NSi8222** | | | | | |
| | $I_{DD1}(Q0)$ | | 0.94 | 1.41 | mA | All Input 0V for NSi822xx0 Or All Input at supply for NSi822xx1 |
| | $I_{DD2}(Q0)$ | | 0.94 | 1.41 | mA | |
| | $I_{DD1}(Q1)$ | | 2.06 | 3.09 | mA | All Input at supply for NSi822xx0 Or All Input 0V for NSi822xx1 |
| | $I_{DD2}(Q1)$ | | 2.06 | 3.09 | mA | |
| | $I_{DD1}(1M)$ | | 1.55 | 2.32 | mA | All Input with 1Mbps, $C_L$=15pF |
| | $I_{DD2}(1M)$ | | 1.55 | 2.32 | mA | |
| | $I_{DD1}(10M)$ | | 1.96 | 2.93 | mA | All Input with 10Mbps, $C_L$=15pF |
| | $I_{DD2}(10M)$ | | 1.96 | 2.93 | mA | |
| | $I_{DD1}(100M)$ | | 5.86 | 10.05 | mA | All Input with 100Mbps, $C_L$ = 15pF |
| | $I_{DD2}(100M)$ | | 5.86 | 10.05 | mA | |

### 5.3. Supply Current Characteristics –3.3V Supply

(VDD1=3.3V± 10%, VDD2=3.3V± 10%, Ta=-55℃ to 125℃. Unless otherwise noted, Typical values are at **VDD1 = 3.3V, VDD2 = 3.3V,** Ta = 25℃)

| Parameters | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| Supply current | **NSi8220** | | | | | |
| | $I_{DD1}$(Q0) | | 0.56 | 0.83 | mA | All Input 0V for NSi8220x0 Or All Input at supply for NSi8220x1 |
| | $I_{DD2}$(Q0) | | 1.24 | 1.86 | mA | |
| | $I_{DD1}$(Q1) | | 2.76 | 4.13 | mA | All Input at supply for NSi8220x0 Or All Input 0V for NSi8220x1 |
| | $I_{DD2}$(Q1) | | 1.27 | 1.91 | mA | |
| | $I_{DD1}$(1M) | | 1.66 | 2.49 | mA | All Input with 1Mbps, $C_L$ = 15pF |
| | $I_{DD2}$(1M) | | 1.31 | 1.97 | mA | |
| | $I_{DD1}$(10M) | | 1.71 | 2.57 | mA | All Input with 10Mbps, $C_L$ = 15pF |
| | $I_{DD2}$(10M) | | 1.80 | 2.70 | mA | |
| | $I_{DD1}$(100M) | | 2.20 | 3.65 | mA | All Input with 100Mbps, $C_L$ = 15pF |
| | $I_{DD2}$(100M) | | 6.50 | 10.77 | mA | |
| | **NSi8221/ NSi8222** | | | | | |
| | $I_{DD1}$(Q0) | | 0.90 | 1.35 | mA | All Input 0V for NSi822xx0 Or All Input at supply for NSi822xx1 |
| | $I_{DD2}$(Q0) | | 0.90 | 1.35 | mA | |
| | $I_{DD1}$(Q1) | | 2.01 | 3.02 | mA | All Input at supply for NSi822xx0 Or All Input 0V for NSi822xx1 |
| | $I_{DD2}$(Q1) | | 2.01 | 3.02 | mA | |
| | $I_{DD1}$(1M) | | 1.49 | 2.23 | mA | All Input with 1Mbps, $C_L$ = 15pF |
| | $I_{DD2}$(1M) | | 1.49 | 2.23 | mA | |
| | $I_{DD1}$(10M) | | 1.76 | 2.63 | mA | All Input with 10Mbps, $C_L$ = 15pF |
| | $I_{DD2}$(10M) | | 1.76 | 2.63 | mA | |
| | $I_{DD1}$(100M) | | 4.35 | 7.27 | mA | All Input with 100Mbps, $C_L$ = 15pF |
| | $I_{DD2}$(100M) | | 4.35 | 7.27 | mA | |

### 5.4. Supply Current Characteristics–2.5V Supply

(VDD1=2.5V± 10%, VDD2=2.5V± 10%, Ta=-55℃ to 125℃. Unless otherwise noted, Typical values are at **VDD1 = 2.5V, VDD2 = 2.5V,** Ta = 25℃)

| Parameters | Symbol | Min | Typ | Max | Unit | Comments |
|---|---|---|---|---|---|---|
| Supply current | **NSi8220** | | | | | |
| | $I_{DD1}(Q0)$ | | 0.54 | 0.81 | mA | All Input 0V for NSi8220x0 Or All Input at supply for NSi8220x1 |
| | $I_{DD2}(Q0)$ | | 1.22 | 1.83 | mA | |
| | $I_{DD1}(Q1)$ | | 2.73 | 4.10 | mA | All Input at supply for NSi8220x0 Or All Input 0V for NSi8220x1 |
| | $I_{DD2}(Q1)$ | | 1.24 | 1.86 | mA | |
| | $I_{DD1}(1M)$ | | 1.64 | 2.46 | mA | All Input with 1Mbps, $C_L$ = 15pF |
| | $I_{DD2}(1M)$ | | 1.27 | 1.91 | mA | |
| | $I_{DD1}(10M)$ | | 1.67 | 2.51 | mA | All Input with 10Mbps, $C_L$ = 15pF |
| | $I_{DD2}(10M)$ | | 1.65 | 2.48 | mA | |
| | $I_{DD1}(100M)$ | | 1.98 | 3.23 | mA | All Input with 100Mbps, $C_L$ = 15pF |
| | $I_{DD2}(100M)$ | | 5.22 | 8.53 | mA | |
| | **NSi8221/ NSi8222** | | | | | |
| | $I_{DD1}(Q0)$ | | 0.88 | 1.32 | mA | All Input 0V for NSi822xx0 Or All Input at supply for NSi822xx1 |
| | $I_{DD2}(Q0)$ | | 0.88 | 1.32 | mA | |
| | $I_{DD1}(Q1)$ | | 1.99 | 2.98 | mA | All Input at supply for NSi822xx0 Or All Input 0V for NSi822xx1 |
| | $I_{DD2}(Q1)$ | | 1.99 | 2.98 | mA | |
| | $I_{DD1}(1M)$ | | 1.46 | 2.18 | mA | All Input with 1Mbps, $C_L$ = 15pF |
| | $I_{DD2}(1M)$ | | 1.46 | 2.18 | mA | |
| | $I_{DD1}(10M)$ | | 1.66 | 2.49 | mA | All Input with 10Mbps, $C_L$ = 15pF |
| | $I_{DD2}(10M)$ | | 1.66 | 2.49 | mA | |
| | $I_{DD1}(100M)$ | | 3.60 | 5.93 | mA | All Input with 100Mbps, $C_L$ = 15pF |
| | $I_{DD2}(100M)$ | | 3.60 | 5.93 | mA | |

## 5.5.  Switching Characteristics - 5V Supply

(VDD1=5V± 10%, VDD2=5V± 10%, Ta=-55℃ to 125℃. Unless otherwise noted, Typical values are at **VDD1 = 5V, VDD2 = 5V,** Ta = 25℃)

| 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 5.7 , $C_L$ = 15pF |
| | $t_{PHL}$ | 2.5 | 8.30 | 15 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Pulse Width Distortion $\|t_{PHL} - t_{PLH}\|$ | PWD | | | 5.0 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Rising Time | $t_r$ | | | 5.0 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Falling Time | $t_f$ | | | 5.0 | ns | See Figure 5.7 , $C_L$ = 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=-55℃ to 125℃. Unless otherwise noted, Typical values are at **VDD1 = 3.3V, VDD2 = 3.3V,** Ta = 25℃)

| 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 5.7 , $C_L$ = 15pF |
| | $t_{PHL}$ | 2.5 | 8.7 | 15 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Pulse Width Distortion $\|t_{PHL} - t_{PLH}\|$ | PWD | | | 5.0 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Rising Time | $t_r$ | | | 5.0 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Falling Time | $t_f$ | | | 5.0 | ns | See Figure 5.7 , $C_L$ = 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=-55℃ to 125℃. Unless otherwise noted, Typical values are at **VDD1 = 2.5V, VDD2 = 2.5V,** Ta = 25℃)

| 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 5.7 , $C_L$ = 15pF |
| | $t_{PHL}$ | 2.5 | 9.3 | 15 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Pulse Width Distortion $\lvert t_{PHL} - t_{PLH} \rvert$ | PWD | | | 5.0 | ns | See Figure 5.7 , $C_L$ = 15pF |
| Rising Time | $t_r$ | | | 5.0 | ns | See Figure 5.7, $C_L$ = 15pF |
| Falling Time | $t_f$ | | | 5.0 | ns | See Figure 5.7, $C_L$ = 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 | |

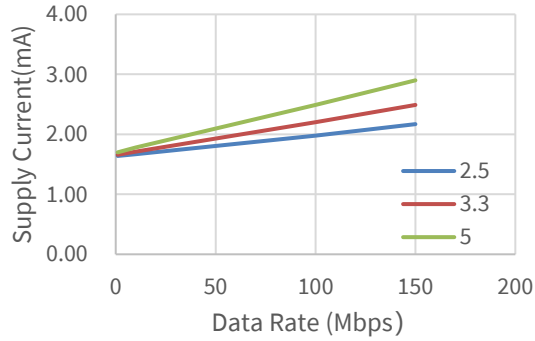## 5.8. Typical Performance Characteristics

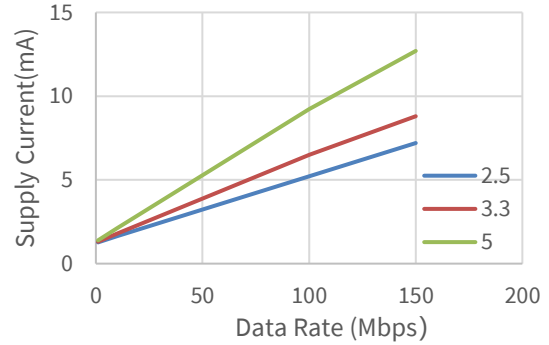Figure 5.1 NSi8220 VDD1 Supply Current vs Data Rate
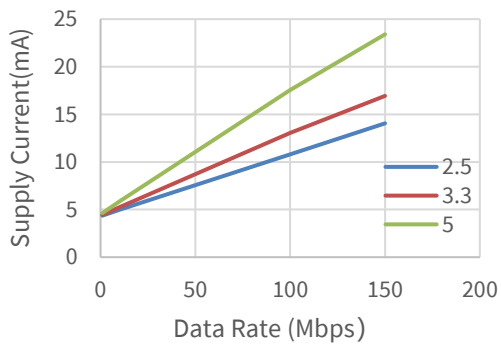
Figure 5.2 NSi8220 VDD2 Supply Current vs Data Rate

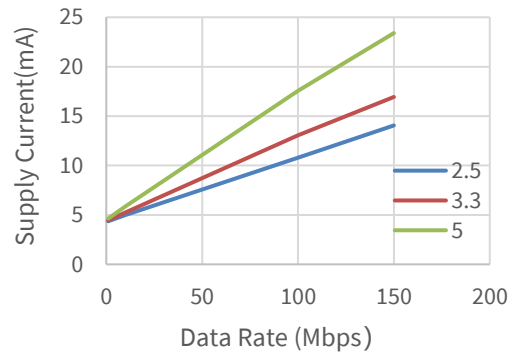Figure 5.3 NSi8221/ NSi8222 VDD1 Supply Current vs Data Rate

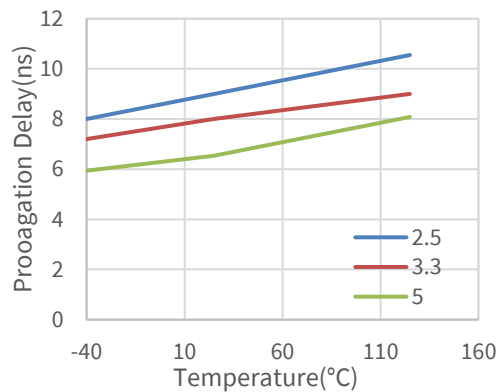Figure 5.4 NSi8221/ NSi8222 VDD2 Supply Current vs Data Rate

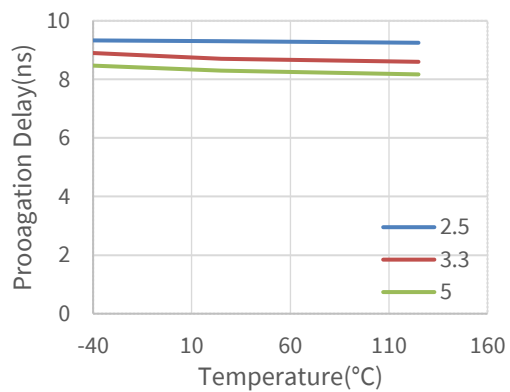Figure 5.5 Rising Edge Propagation Delay Vs Temp

Figure 5.6 Falling Edge Propagation Delay Vs Temp

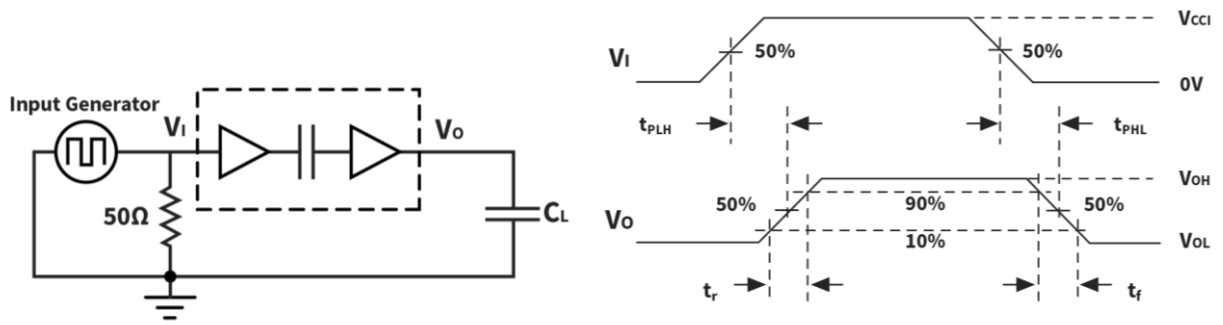### 5.9. Parameter Measurement Information



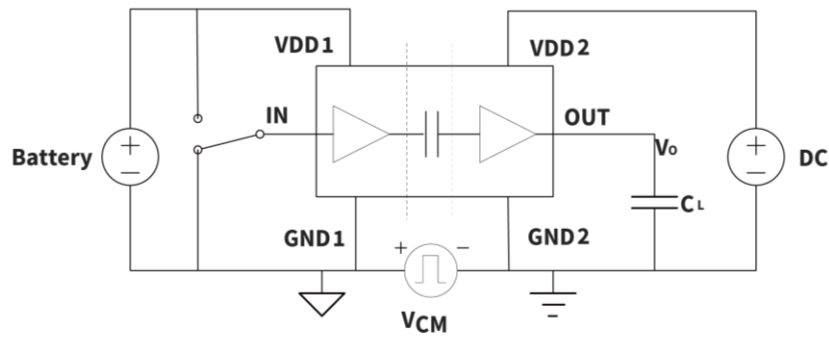Figure 5.7 Switching Characteristics Test Circuit and Waveform



Figure 5.8 Common-Mode Transient Immunity Test Circuit

# 6. High Voltage Feature Description

## 6.1. Insulation and Safety Related Specifications

| Description | Test Condition | Symbol | Value | | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | SOP8 | SOW8 | SOW16 | SOWW16 | |
| Minimum External Air Gap (Clearance) | | L(I01) | 4.0 | 8.0 | 8.0 | 15 | mm |
| Minimum External Tracking (Creepage) | | L(I02) | 4.0 | 8.0 | 8.0 | 15 | mm |
| Minimum internal gap | | DTI | 28 | | | | um |
| Tracking Resistance (Comparative Tracking Index) | DIN EN 60112 (VDE 0303-11) | CTI | >400 | >600 | >600 | >600 | V |
| Material Group | IEC 60112 | | II | I | I | I | |
| Installation Classification per DIN VDE 0110 | | | | | | | |
| For Rated Mains Voltage ≤ 150V$_{rms}$ | | | I to IV | I to IV | I to IV | I to IV | |
| For Rated Mains Voltage ≤ 300V$_{rms}$ | | | I to III | I to IV | I to IV | I to IV | |
| For Rated Mains Voltage ≤ 600V$_{rms}$ | | | I to II | I to IV | I to IV | I to IV | |
| For Rated Mains Voltage ≤ 1000V$_{rms}$ | | | I | I to III | I to III | I to III | |
| Climatic Classification | | | 10/105/21 | 10/105/21 | 10/105/21 | 10/105/21 | |
| Pollution Degree per DIN VDE 0110, Table 1 | | | 2 | 2 | 2 | 2 | |
| Maximum repetitive isolation voltage | | V$_{IORM}$ | 565 | 2121 | 2121 | 2121 | Vpeak |
| Maximum Working Isolation Voltage | AC voltage | V$_{IOWM}$ | 400 | 1500 | 1500 | 1500 | V$_{RMS}$ |
| | DC voltage | | 565 | 2121 | 2121 | 2121 | V$_{DC}$ |
| Input to Output Test Voltage, Method B1 | V$_{IORM}$ × 1.5 = V$_{pd(m)}$, 100% production test, $t_{ini}$ = $t_m$ = 1 sec, $q_{pd}$ < 5 pC | V$_{pd (m)}$ | 847 | / | / | / | Vpeak |
| | V$_{IORM}$ × 1.875 = V$_{pd(m)}$, 100% production test, $t_{ini}$ = $t_m$ = 1 sec, $q_{pd}$ < 5 pC | | / | 3977 | 3977 | 3977 | |
| Input to Output Test Voltage, Method A | | | | | | | |
| After Environmental Tests Subgroup 1 | V$_{IORM}$ × 1.3=V$_{pd (m)}$, $t_{ini}$ = 60 sec, $t_m$=10 sec, $q_{pd}$ < 5 pC | V$_{pd (m)}$ | 678 | / | / | / | Vpeak |

| Description | Test Condition | Symbol | Value | | | | Unit |
|---|---|---|---|---|---|---|---|
| | $V_{IORM} \times 1.6 = V_{pd(m)}$, $t_{ini} = 60$ sec, $t_m = 10$ sec, $q_{pd} < 5$ pC | | / | 3394 | 3394 | 3394 | |
| After Input and /or Safety Test Subgroup 2 and Subgroup 3 | $V_{IORM} \times 1.2 = V_{pd(m)}$, $t_{ini} = 60$ sec, $t_m = 10$ sec, partial discharge < 5 pC | $V_{pd(m)}$ | 678 | 2545 | 2545 | 2545 | Vpeak |
| Maximum transient isolation voltage | t = 60 sec | VIOTM | 5300 | 8000 | 8000 | 12000 | Vpeak |
| Maximum Surge Isolation Voltage | Test method per IEC60065,1.2/50us waveform, VTEST=VIOSM×1.3 | VIOSM | 5384 | | | | Vpeak |
| | Test method per IEC60065,1.2/50us waveform, VTEST=VIOSM×1.6 | | | 6250 | 6250 | 6250 | Vpeak |
| Isolation resistance | $V_{IO} = 500V$ at $T_{amb} = T_S$ | RIO | $>10^9$ | $>10^9$ | $>10^9$ | $>10^9$ | Ω |
| | $V_{IO} = 500V$ at $100°C \le T_{amb} \le 125°C$ | | $>10^{11}$ | $>10^{11}$ | $>10^{11}$ | $>10^{11}$ | Ω |
| Isolation capacitance | f = 1MHz | CIO | 0.6 | 0.6 | 0.6 | 0.6 | pF |
| Input capacitance | | CI | 2 | 2 | 2 | 2 | pF |
| Case Temperature | | Ts | 150 | 150 | 150 | 150 | ℃ |
| Insulation Specification per UL1577 | | | | | | | |
| Withstand Isolation Voltage | $V_{TEST} = 1.2 \times V_{ISO}$, t = 1 sec, 100% production test | VISO | 3750 | 5000 | 5000 | 8000 | $V_{RMS}$ |

1) This coupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

## 6.2. Safety-Limiting Values

Basic isolation safety-limiting values as outlined in VDE-0884-11 of NSi822xN-DSPR SOP8(150mil)

| Description | Test Condition | Value | Unit |
|---|---|---|---|
| Safety Supply Power | $R_{\theta JA} = 137.7$ ℃/W, T J = 150 ℃, T A = 25 ℃ | 908 | mW |
| Safety Supply Current | $R_{\theta JA} = 137.7$ ℃/W, V I = 5.5 V, T J = 150 ℃, T A = 25 ℃ | 165 | mA |
| Safety Temperature[2] | | 150 | °C |

1) Calculate with the junction-to-air thermal resistance, $R_{\theta JA}$, of SOP8(150mil) 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.
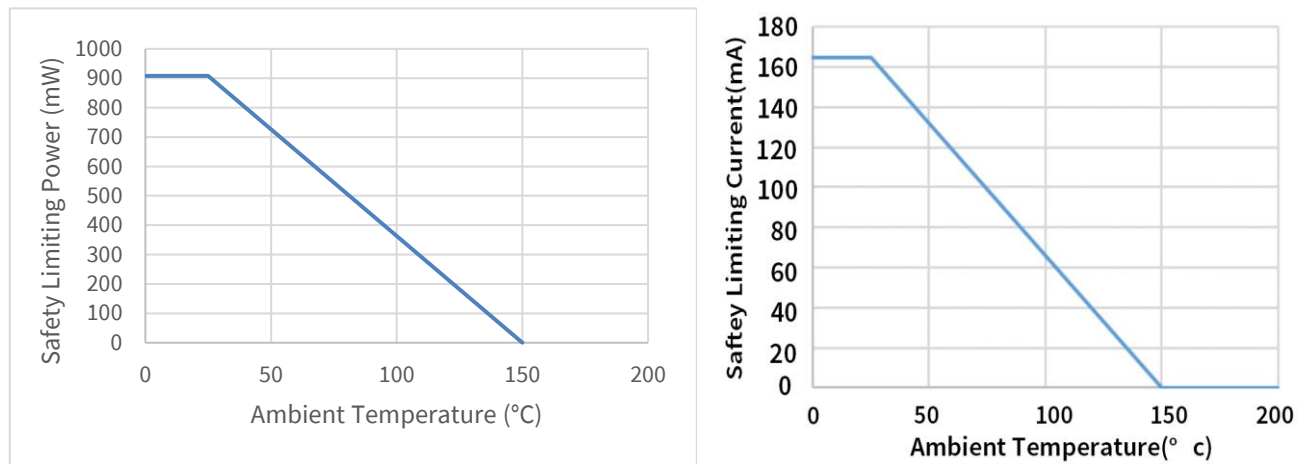
Figure 6.1 NSi822xN-DSPR Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN VDE V 0884-11

Reinforced isolation safety-limiting values as outlined in VDE-0884-11 of NSi822xW-DSWVR SOW8(300mil)

| Description | Test Condition | Value | Unit |
|---|---|---|---|
| Safety Supply Power | $R_{\theta JA}$ = 84.3 ℃/W, V I = 5.5 V, T J = 150 ℃, T A = 25 ℃ | 1483 | mW |
| Safety Supply Current | $R_{\theta JA}$ = 84.3 ℃/W, T J = 150 ℃, T A = 25 ℃ | 269.6 | mA |
| Safety Temperature[2] | | 150 | ℃ |

1) Calculate with the junction-to-air thermal resistance, $R_{\theta JA}$, of SOW8(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.
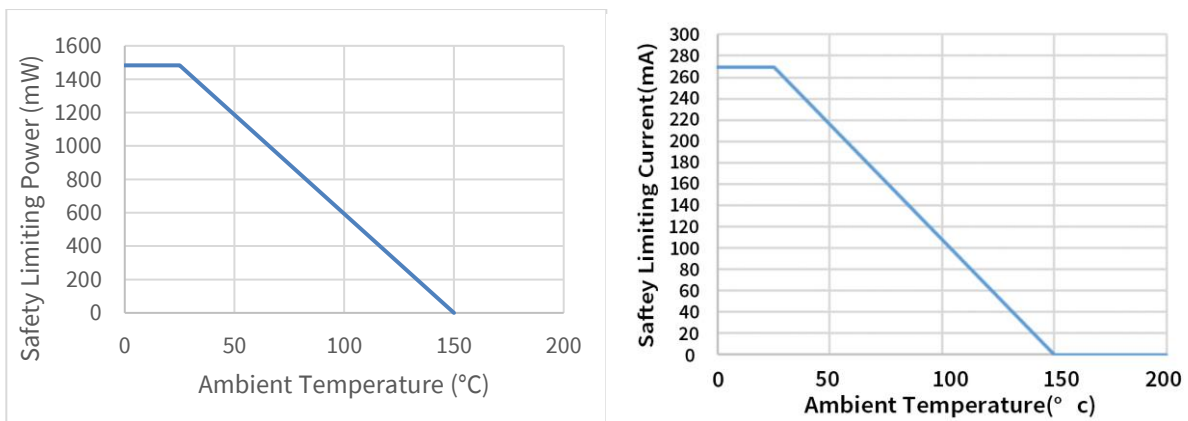


Figure 6.2 NSi822xW-DSWVR Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN VDE V 0884-11

Reinforced isolation safety-limiting values as outlined in VDE-0884-11 of NSi822xW-DSWR SOW16(300mil)

| Description | Test Condition | Value | Unit |
|---|---|---|---|
| Safety Supply Power | $R_{\theta JA}$ = 86.5 ℃/W, V I = 5.5 V, T J = 150 ℃, T A = 25 ℃ | 1445 | mW |
| Safety Supply Current | $R_{\theta JA}$ = 86.5 ℃/W, T J = 150 ℃, T A = 25 ℃ | 262.7 | mA |
| Safety Temperature[2] | | 150 | ℃ |

1)   Calculate with the junction-to-air thermal resistance, $R_{\theta JA}$, of SOW16(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.
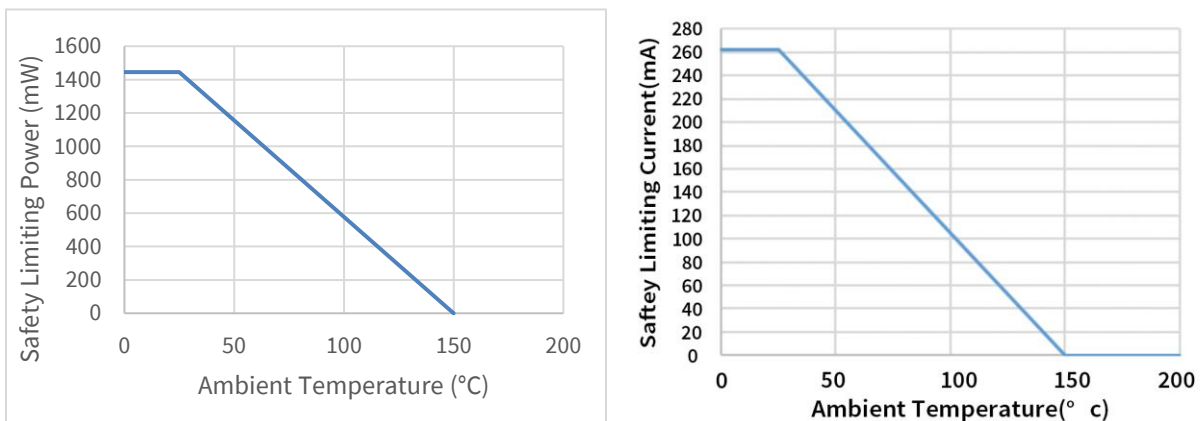


Figure 6.3 NSi822xW-DSWR Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN VDE V 0884-11

Reinforced isolation safety-limiting values as outlined in VDE-0884-11 of NSi822xW-DSWWR SOWW16(600mil)

| Description | Test Condition | Value | Unit |
|---|---|---|---|
| Safety Supply Power | $R_{\theta JA}$ = 86.5 ℃/W, V I = 5.5 V, T J = 150 ℃, T A = 25 ℃ | 1445 | mW |
| Safety Supply Current | $R_{\theta JA}$ = 86.5 ℃/W, T J = 150 ℃, T A = 25 ℃ | 262.7 | mA |
| Safety Temperature[2] | | 150 | ℃ |

1)   Calculate with the junction-to-air thermal resistance, $R_{\theta JA}$, of SOWW16(600mil) 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.
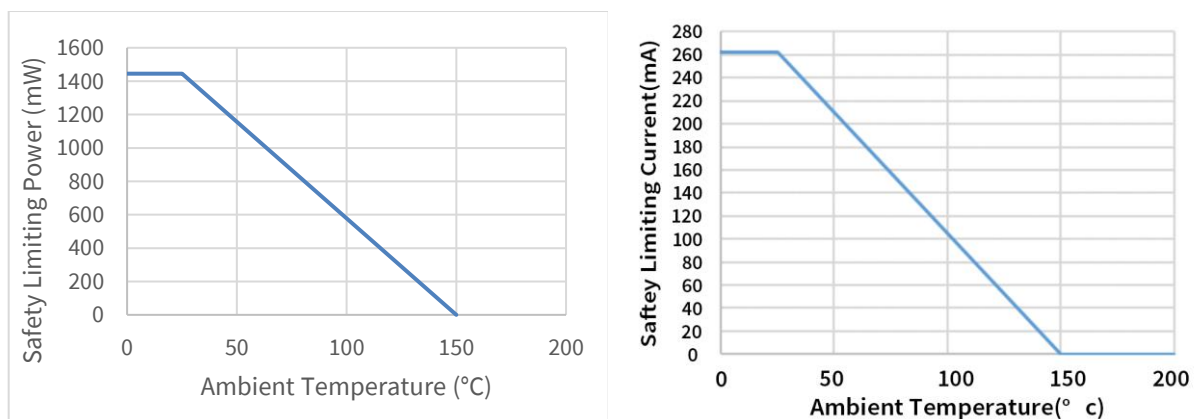


Figure 6.4 NSi822xW-DSWWR Thermal Derating Curve, Dependence of Safety Limiting Values with Case Temperature per DIN VDE V 0884-1

### 6.3. Regulatory Information

The NSi822xN- DSPR are approved by the organizations listed in table.

| CUL | | VDE | CQC |
|---|---|---|---|
| UL 1577 Component Recognition Program | Approved under CSA Component Acceptance Notice 5A | DIN VDE V 0884-11:2017-01 | Certified by CQC11-471543-2012 GB4943.1-2011 |
| Single Protection, 3750V$_{rms}$ Isolation voltage | Single Protection, 3750V$_{rms}$ Isolation voltage | Basic Insulation 565Vpeak, V$_{IOSM}$=5384Vpeak | Basic insulation |
| File (E500602) | File (E500602) | File (40050121) | File (CQC20001264940) |

The NSi822xW-DSWVR are approved by the organizations listed in table.

| CUL | | VDE | CQC |
|---|---|---|---|
| UL 1577 Component Recognition Program | Approved under CSA Component Acceptance Notice 5A | DIN VDE V 0884-11(VDE V 0884-11):2017-01 | Certified by CQC11-471543-2012 GB4943.1-2011 |
| Single Protection, 5000V$_{rms}$ Isolation voltage | Single Protection, 5000V$_{rms}$ Isolation voltage | Reinforced Insulation 2121Vpeak, V$_{IOSM}$=6250Vpeak | Reinforced insulation |
| File (E500602) | File (E500602) | File (40052820) | File (CQC20001264938) |

The NSi822xW-DSWR are approved by the organizations listed in table.

| CUL | | VDE | CQC |
|---|---|---|---|
| UL 1577 Component Recognition Program | Approved under CSA Component Acceptance Notice 5A | DIN VDE V 0884-11(VDE V 0884-11):2017-01 | Certified by CQC11-471543-2012 GB4943.1-2011 |
| Single Protection, 5000V$_{rms}$ Isolation voltage | Single Protection, 5000V$_{rms}$ Isolation voltage | Reinforced Insulation 2121Vpeak, V$_{IOSM}$=6250Vpeak | Reinforced insulation |
| File (E500602) | File (E500602) | File (40052820) | File (CQC20001264939) |

The NSi822xW-DSWWR are approved by the organizations listed in table.

| CUL | | VDE | CQC |
|---|---|---|---|
| UL 1577 Component Recognition Program | Approved under CSA Component Acceptance Notice 5A | DIN VDE V 0884-11(VDE V 0884-11):2017-01 | Certified by CQC11-471543-2012 GB4943.1-2011 |
| Single Protection, 8000V$_{rms}$ Isolation voltage | Single Protection, 8000V$_{rms}$ Isolation voltage | Reinforced Insulation 2121Vpeak, V$_{IOSM}$=6250Vpeak | Reinforced insulation |
| File (pending) | File (pending) | File (pending) | File (pending) |

# 7. Function Description

## 7.1. Overview

The NSi822x is a Dual-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 NSi822x devices are high reliability dual-channel digital isolator. The NSi822x device is safety certified by UL1577 support several insulation withstand voltages ($3.75kV_{rms}$, $5kV_{rms}$), while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of the NSi822x is up to 150Mbps, and the common-mode transient immunity (CMTI) is up to 250kV/us. The NSi822x device provides digital channel direction configuration and the default output level configuration when the input power is lost. Wide supply voltage of the NSi822x device 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.

The NSi822x 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 output B follows the same status with the input A within 60us after powering up.

Table 7.1 Output status vs. power status

| Input | VDD1 status | VDD2 status | Output | Comment |
|---|---|---|---|---|
| H[1] | Ready | Ready | H | Normal operation. |
| L[2] | Ready | Ready | L | |
| X[3] | Unready | Ready | L(NSi822xx0) H(NSi822xx1) | The output follows the same status with the input within 60us after input side VDD1 is powered on. |
| X | Ready | Unready | X | The output follows the same status with the input within 60us 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 out side power. | | | | |

## 7.2.  OOK Modulation

NSi822x 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 7.1, 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.
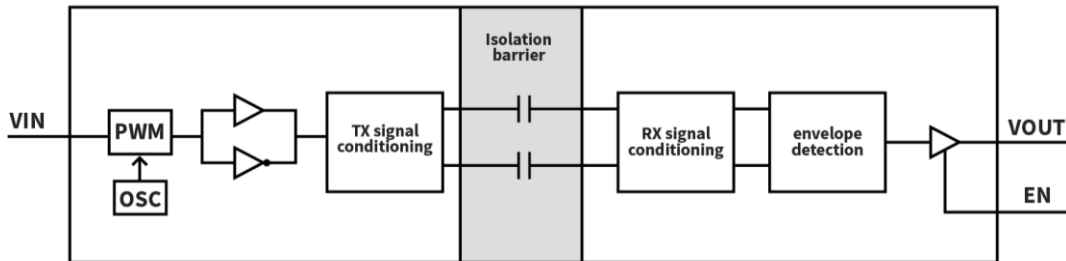


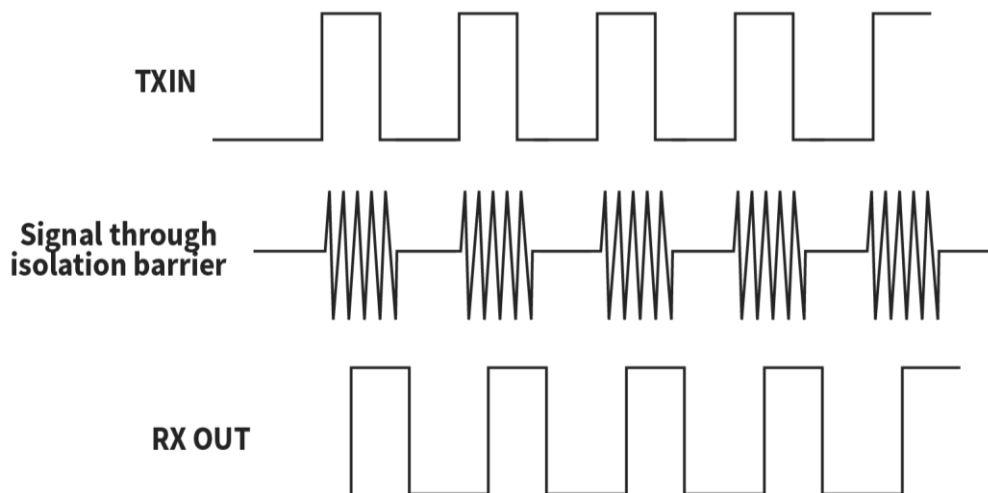Figure 7.1 Single Channel Function Block Diagram



Figure 7.2 OOK Modulation

# 8. Application Note
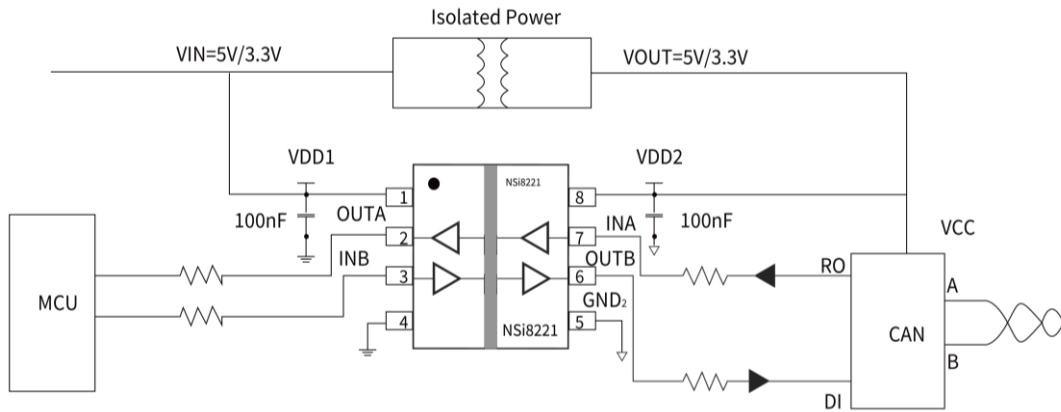
## 8.1. Typical Application Circuit



Figure 8.1 Typical SCH for ISO CAN Interface

## 8.2. PCB Layout

The NSi822x 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 8.2 to Figure 8.5 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, ±40%. When driving loads where transmission line effects will be a factor, output pins should be appropriately terminated with controlled impedance PCB traces.
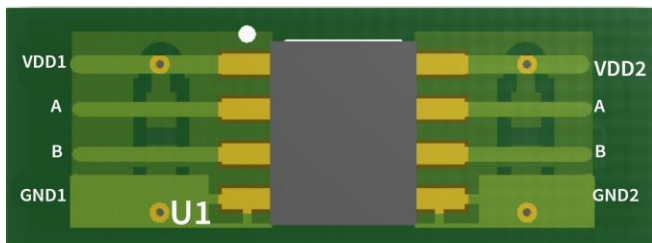


Figure8.2 Recommended PCB Layout — Top Layer
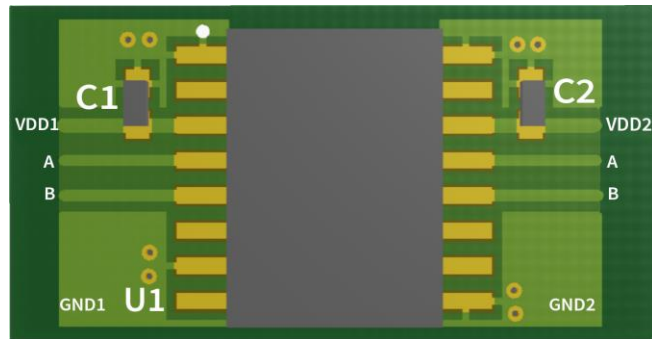


Figure8.3 Recommended PCB Layout — Bottom Layer

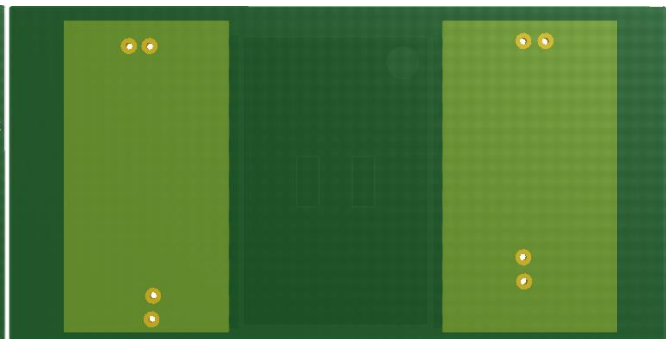

Figure8.4 Recommended PCB Layout — Top Layer



Figure8.5 Recommended PCB Layout — Bottom Layer

## 8.3. High Speed Performance

Figure 8.6 shows the eye diagram of NSi822x at 200Mbps data rate output. The result shows a typical measurement on the NSi822x with 350ps p-p jitter.
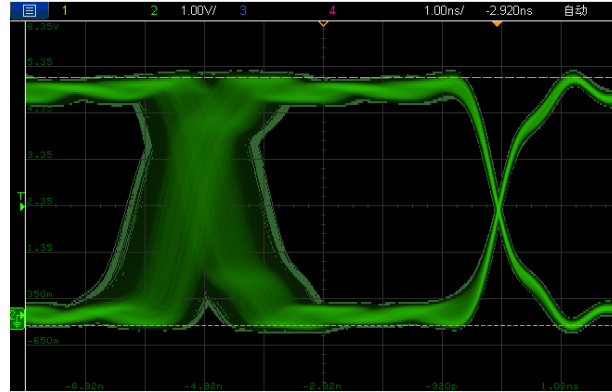


Figure8.6 NSi822x Eye Diagram

## 8.4. Typical Supply Current Equations

The typical supply current of NSi822x 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

**NSi8220:**

$I_{DD1}$ = 0.19 *a1+1.45*b1+0.82*c1.

$I_{DD2}$ = 1.36+ VDD1*f* $C_L$ *c1*$10^{-9}$

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.

**NSi8221/ NSi8222:**

$I_{DD1}$ = 0.87 +1.26*b1+0.63*c1+ VDD1*f* $C_L$ *c2*$10^{-9}$

$I_{DD2}$ = 0.87 +1.26*b2+0.63*c2+ VDD1*f* $C_L$ *c1*$10^{-9}$

When b1 is the channel number of high input at side 1, c1 is the channel number of switch signal input at side 1, b2 is the channel number of high input at side 2, c2 is the channel number of switch signal input at side 2.

# 9. Package Information



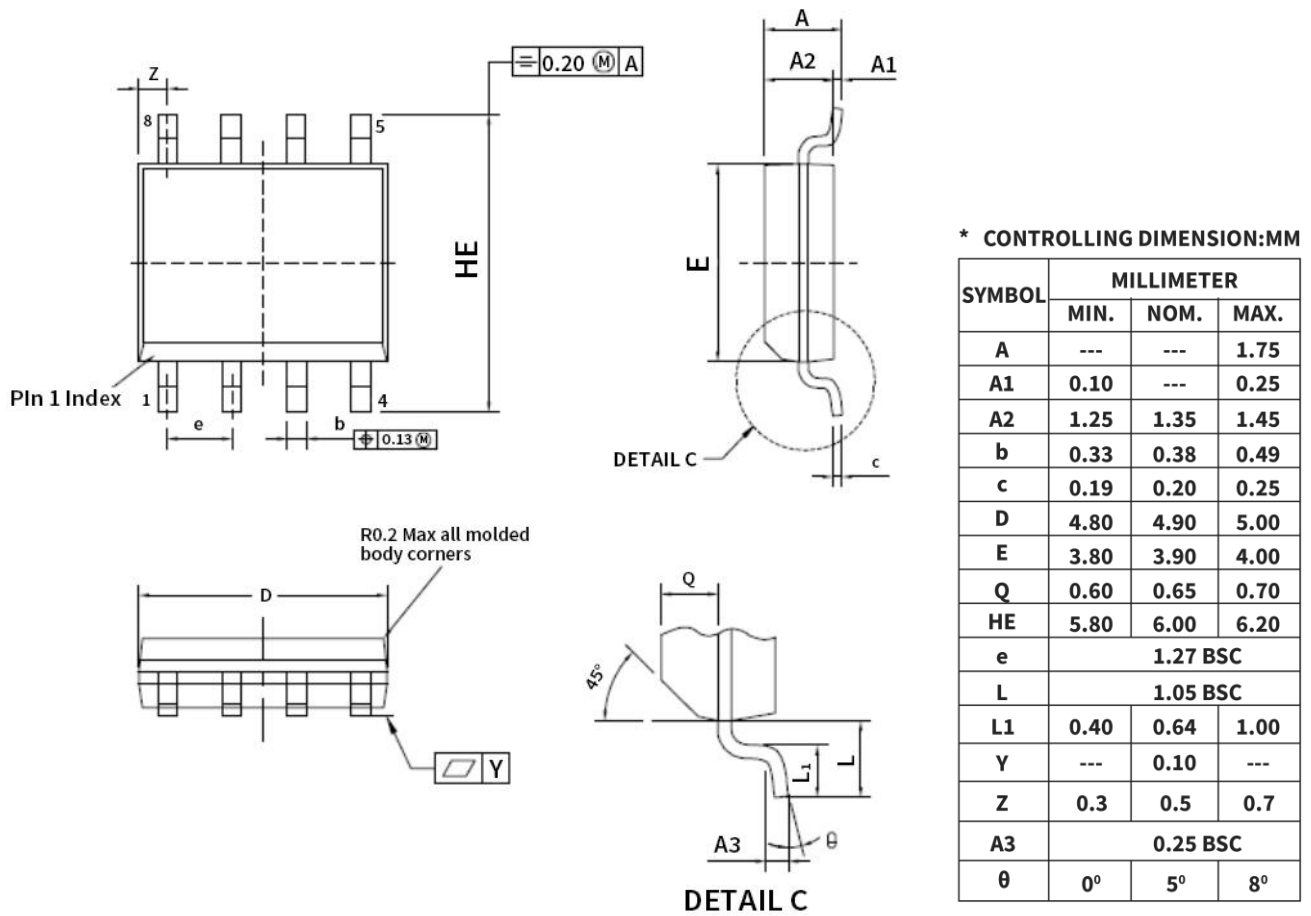| SYMBOL | MILLIMETER | | |
|--------|------|------|------|
| | MIN. | NOM. | MAX. |
| A | --- | --- | 1.75 |
| A1 | 0.10 | --- | 0.25 |
| A2 | 1.25 | 1.35 | 1.45 |
| b | 0.33 | 0.38 | 0.49 |
| c | 0.19 | 0.20 | 0.25 |
| D | 4.80 | 4.90 | 5.00 |
| E | 3.80 | 3.90 | 4.00 |
| Q | 0.60 | 0.65 | 0.70 |
| HE | 5.80 | 6.00 | 6.20 |
| e | 1.27 BSC | | |
| L | 1.05 BSC | | |
| L1 | 0.40 | 0.64 | 1.00 |
| Y | --- | 0.10 | --- |
| Z | 0.3 | 0.5 | 0.7 |
| A3 | 0.25 BSC | | |
| θ | 0° | 5° | 8° |

\* CONTROLLING DIMENSION:MM

Figure 9.1 SOP8 Package Shape and Dimension in millimeters
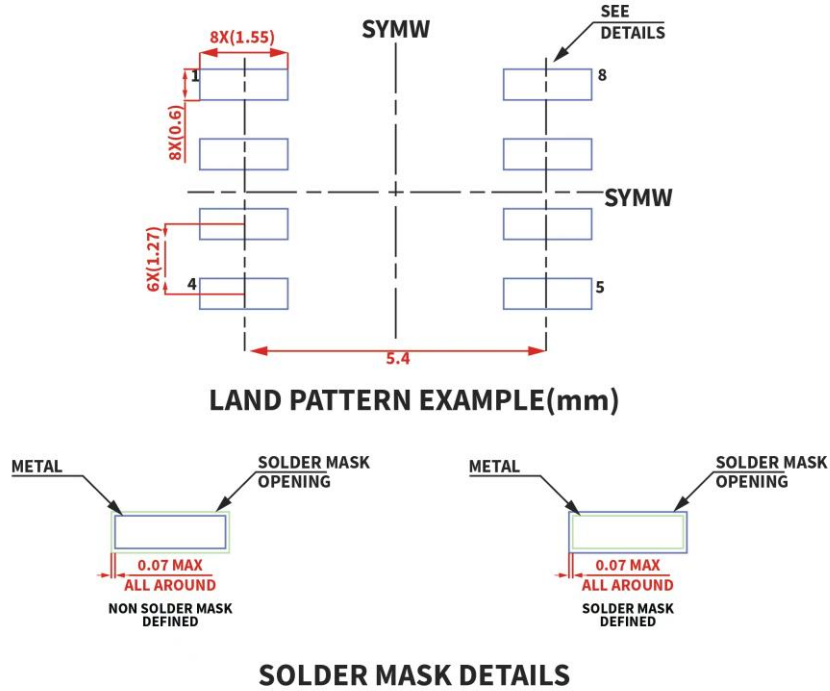
Figure 9.2 SOP8 Package Board Layout Example



* CONTROLLING DIMENSION:MM

| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | --- | --- | 2.80 |
| A1 | 0.36 | --- | 0.46 |
| A2 | 2.20 | 2.30 | 2.40 |
| A3 | --- | 0.25 | --- |
| Q | 0.97 | 1.02 | 1.07 |
| b | 0.31 | 0.41 | 0.51 |
| c | 0.13 | --- | 0.33 |
| D | 5.75 | 5.85 | 5.95 |
| E | 7.40 | 7.50 | 7.60 |
| E1 | 11.25 | 11.50 | 11.75 |
| e | 1.27 bsc | | |
| L | 2.00 bsc | | |
| L1 | 0.50 | --- | 1.00 |
| y | --- | 0.10 | --- |
| θ | 0⁰ | --- | 8⁰ |

NOTES
1.0 COPWNARITY APPUES TO LEADS, CORNER LEADS AND DIE ATTACH PAD.

Figure 9.3 SOW8 Package Shape and Dimension in millimeters

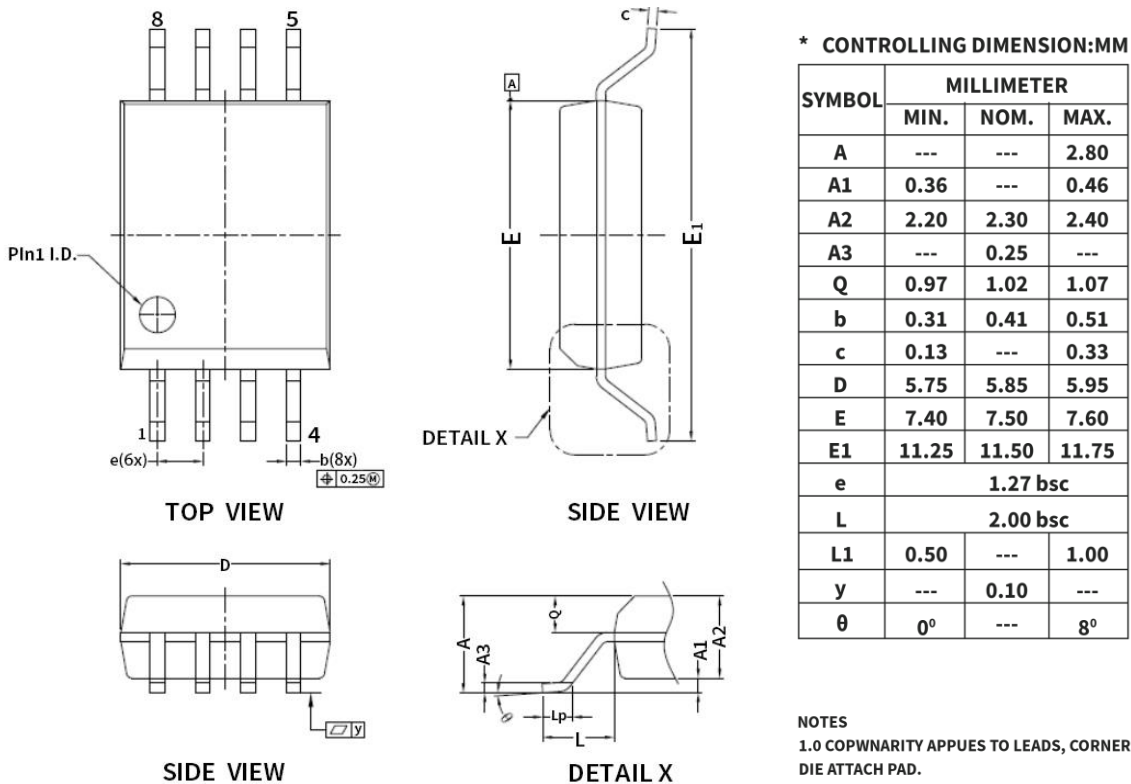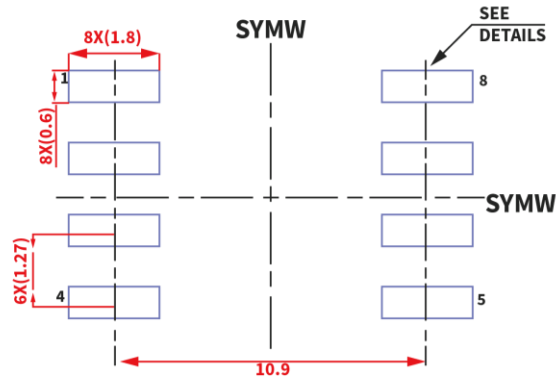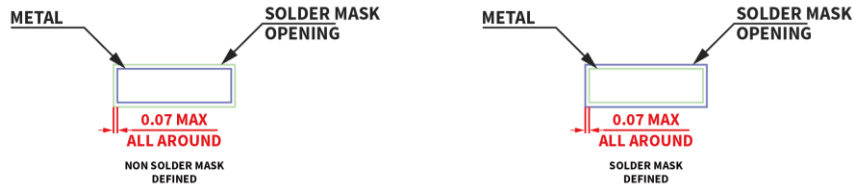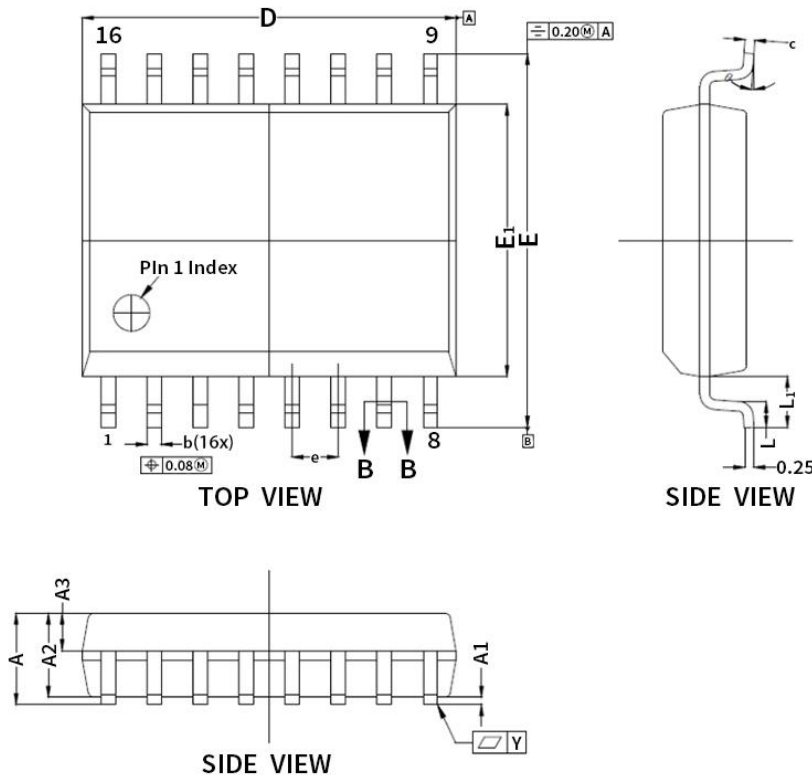**LAND PATTERN EXAMPLE(mm)**
**9.1mm NOMINAL**
**CLEARANCE/CREEPAGE**



**SOLDER MASK DETAILS**

Figure 9.4 SOW8 Package Board Layout Example



**\* 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 | 0⁰ | --- | 8⁰ |

Figure 9.5 SOP16(300mil)/SOW16 Package Shape and Dimension in millimeters

Figure 9.6 SOP16(300mil)/SOW16 Package Board Layout Example

| 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 | 10.42 | 10.52 | 10.62 |
| E | 13.9 | 14.0 | 14.1 |
| E1 | 17.1 | --- | 17.4 |
| e | 1.27 bsc | | |
| L1 | 1.625 bsc | | |
| L | 0.6 | --- | 1.1 |
| Y | --- | 0.10 | --- |
| θ | 0° | --- | 8° |

\* CONTROLLING DIMENSION:MM

NOTES
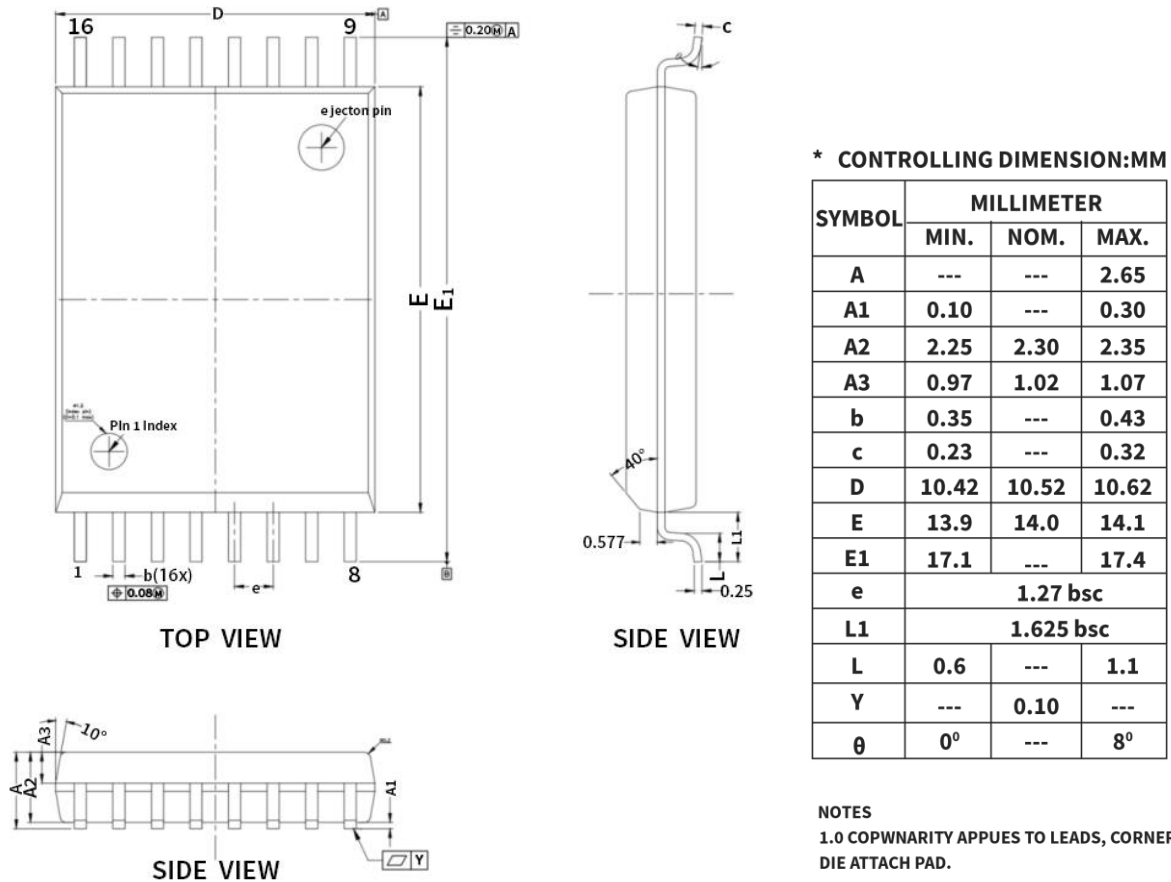1.0 COPWNARITY APPUES TO LEADS, CORNER LEADS AND DIE ATTACH PAD.

Figure 9.7 SOP16(600mil)/SOWW16 Package Shape and Dimension in millimeters
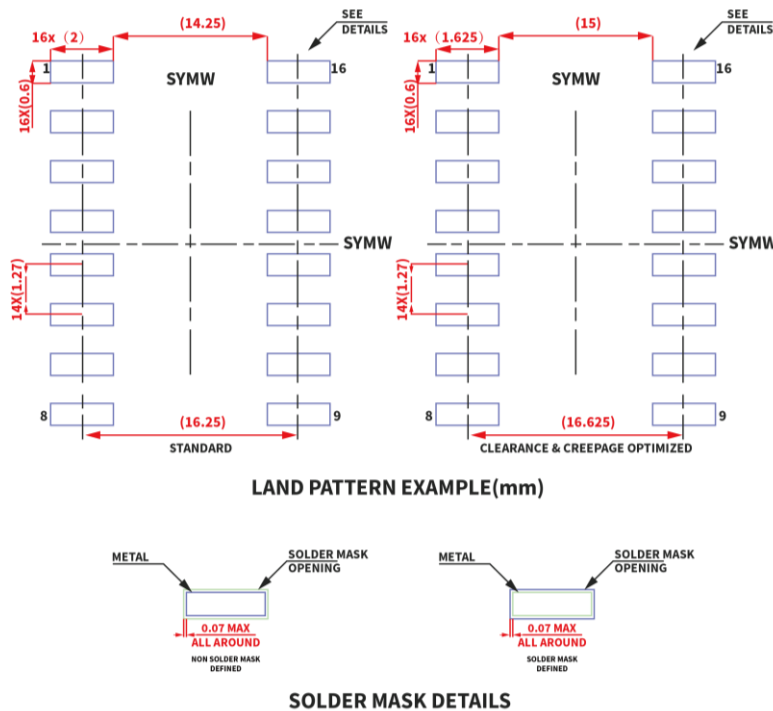


Figure 9.8 SOP16(600mil)/SOWW16 Package Board Layout Example

## 10. 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| NSi8220N0-DSPR | 3.75 | 2 | 0 | 150 | Low | -55 to 125℃ | 1 | SOP8 (150mil) | SOP8 | 2500 |
| NSi8220N1-DSPR | 3.75 | 2 | 0 | 150 | High | -55 to 125℃ | 1 | SOP8 (150mil) | SOP8 | 2500 |
| NSi8221N0-DSPR | 3.75 | 1 | 1 | 150 | Low | -55 to 125℃ | 1 | SOP8 (150mil) | SOP8 | 2500 |
| NSi8221N1-DSPR | 3.75 | 1 | 1 | 150 | High | -55 to 125℃ | 1 | SOP8 (150mil) | SOP8 | 2500 |
| NSi8222N0-DSPR | 3.75 | 1 | 1 | 150 | Low | -55 to 125℃ | 1 | SOP8 (150mil) | SOP8 | 2500 |
| NSi8222N1-DSPR | 3.75 | 1 | 1 | 150 | High | -55 to 125℃ | 1 | SOP8 (150mil) | SOP8 | 2500 |
| NSi8220W0-DSWR | 5 | 2 | 0 | 150 | Low | -55 to 125℃ | 2 | SOW16 (300mil) | SOW16 | 1000 |
| NSi8220W1-DSWR | 5 | 2 | 0 | 150 | High | -55 to 125℃ | 2 | SOW16 (300mil) | SOW16 | 1000 |
| NSi8221W0-DSWR | 5 | 1 | 1 | 150 | Low | -55 to 125℃ | 2 | SOW16 (300mil) | SOW16 | 1000 |
| NSi8221W1-DSWR | 5 | 1 | 1 | 150 | High | -55 to 125℃ | 2 | SOW16 (300mil) | SOW16 | 1000 |
| NSi8222W0-DSWR | 5 | 1 | 1 | 150 | Low | -55 to 125℃ | 2 | SOW16 (300mil) | SOW16 | 1000 |
| NSi8222W1-DSWR | 5 | 1 | 1 | 150 | High | -55 to 125℃ | 2 | SOW16 (300mil) | SOW16 | 1000 |
| NSi8220W0-DSWVR | 5 | 2 | 0 | 150 | Low | -55 to 125℃ | 3 | SOW8 (300mil) | SOW8 | 1000 |
| NSi8220W1-DSWVR | 5 | 2 | 0 | 150 | High | -55 to 125℃ | 3 | SOW8 (300mil) | SOW8 | 1000 |
| NSi8221W0-DSWVR | 5 | 1 | 1 | 150 | Low | -55 to 125℃ | 3 | SOW8 (300mil) | SOW8 | 1000 |
| NSi8221W1-DSWVR | 5 | 1 | 1 | 150 | High | -55 to 125℃ | 3 | SOW8 (300mil) | SOW8 | 1000 |
| NSi8222W0-DSWVR | 5 | 1 | 1 | 150 | Low | -55 to 125℃ | 3 | SOW8 (300mil) | SOW8 | 1000 |
| NSi8222W1-DSWVR | 5 | 1 | 1 | 150 | High | -55 to 125℃ | 3 | SOW8 (300mil) | SOW8 | 1000 |
| NSi8220W0-DSWWR | 8 | 2 | 0 | 150 | Low | -55 to 125℃ | 3 | SOW16 (600mil) | SOWW16 | 1000 |
| NSi8220W1-DSWWR | 8 | 2 | 0 | 150 | High | -55 to 125℃ | 3 | SOW16 (600mil) | SOWW16 | 1000 |
| NSi8221W0- | 8 | 1 | 1 | 150 | Low | -55 to 125℃ | 3 | SOW16 | SOWW16 | 1000 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| DSWWR | | | | | | | | (600mil) | | |
| NSi8221W1-DSWWR | 8 | 1 | 1 | 150 | High | -55 to 125℃ | 3 | SOW16 (600mil) | SOWW16 | 1000 |
| NSi8222W0-DSWWR | 8 | 1 | 1 | 150 | Low | -55 to 125℃ | 3 | SOW16 (600mil) | SOWW16 | 1000 |
| NSi8222W1-DSWWR | 8 | 1 | 1 | 150 | High | -55 to 125℃ | 3 | SOW16 (600mil) | SOWW16 | 1000 |

NOTE: All packages are RoHS-compliant with peak reflow temperatures of 260 ℃ according to the JEDEC industry standard classifications and peak solder temperatures.
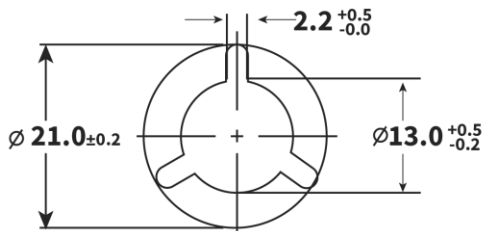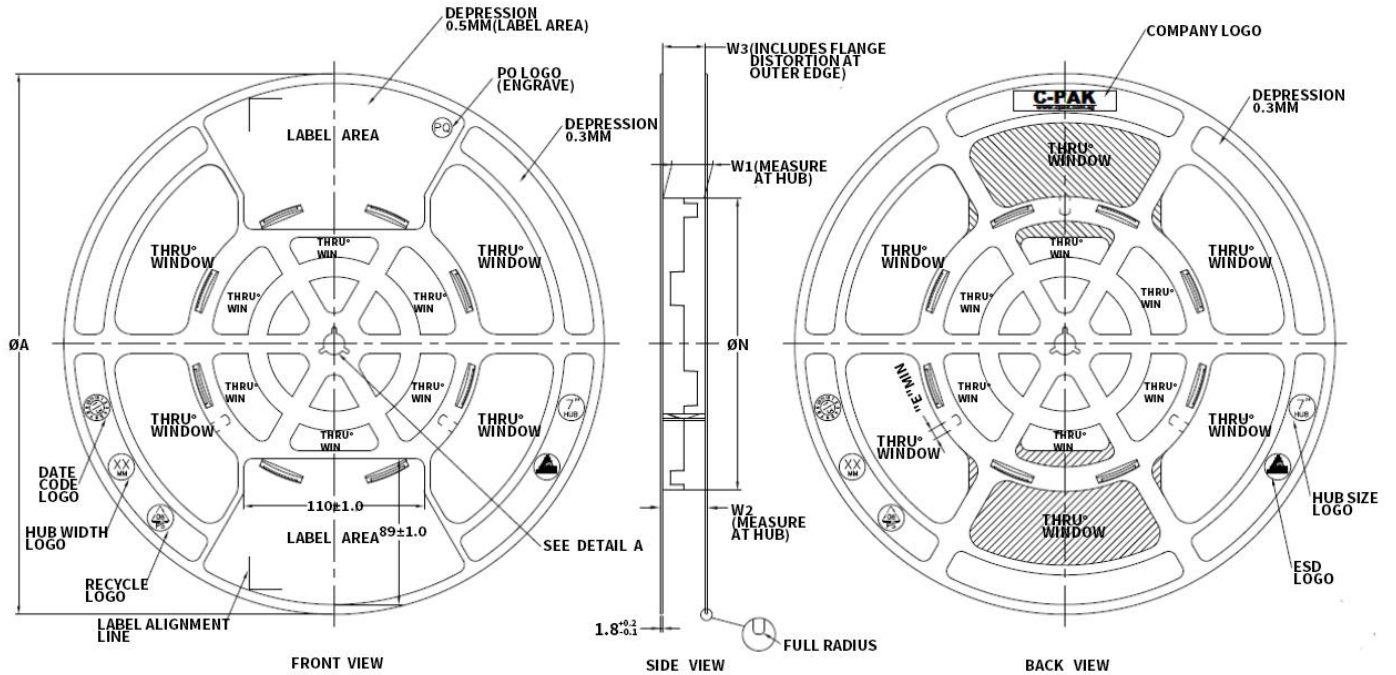
**Part Number Rule:**
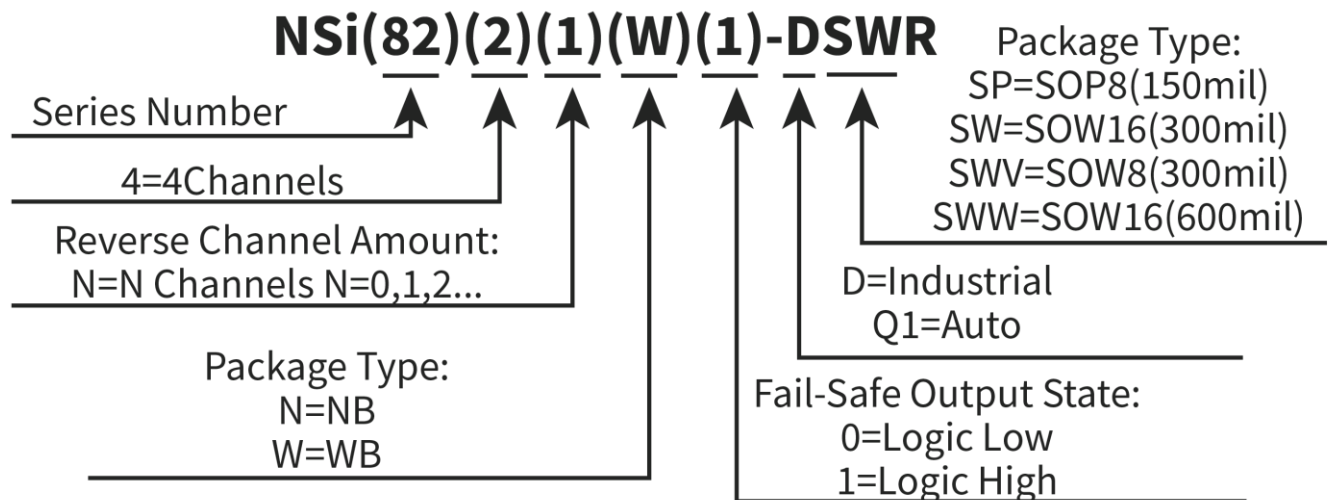


## 11. Documentation Support

| Part Number | Product Folder | Datasheet | Technical Documents | Isolator selection guide |
|---|---|---|---|---|
| NSi822x | tbd | tbd | tbd | tbd |

## 12. Tape and Reel Information



| PRODUCT SPECIFICATION | | | | | | |
|---|---|---|---|---|---|---|
| TAPE WIDTH | ⌀A ±2.0 | ⌀N ±2.0 | W1 | W2 (Max) | W3 | E (MIN) |
| 08MM | 330 | 178 | $8.4^{+1.5}_{-0.0}$ | 14.4 | SHALL ACCOMMODATE TAPE WIDTH WITHOUT NTERFERENCE | 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 |

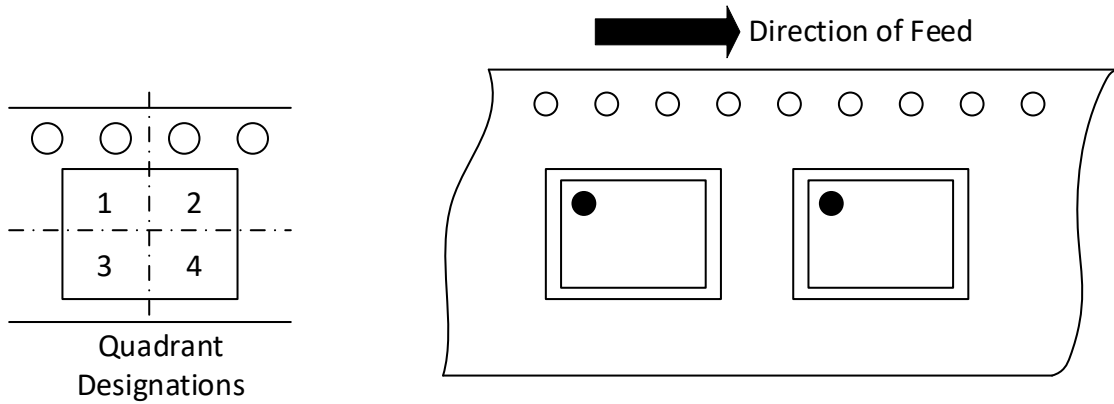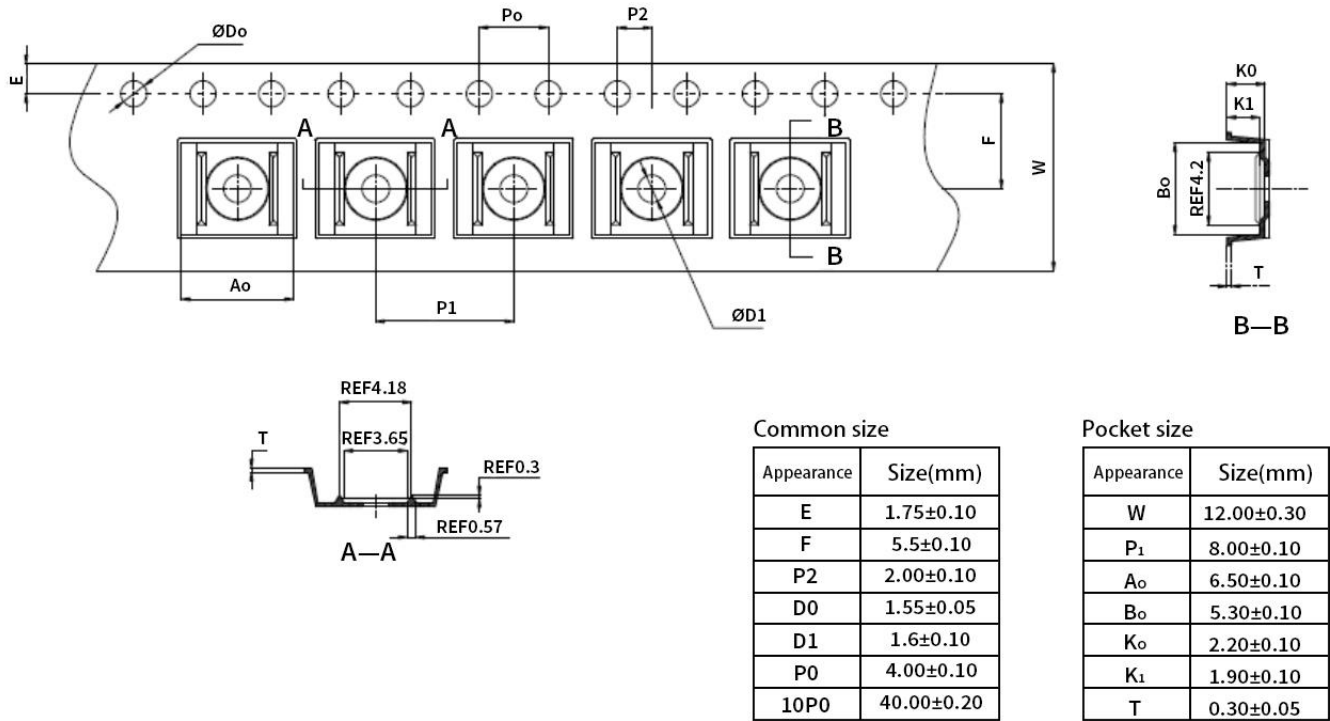| SURFACE RESISTIVITY | | | |
|---|---|---|---|
| LEGEND | SR RANGE | TYPE | COLOUR |
| A | BELOW $10^{12}$ | ANTISTATIC | ALL TYPES |
| B | $10^6$ TO $10^{11}$ | STATIC DISSIPATIVE | BLACK ONLY |
| C | $10^5$ & BELOW $10^5$ | CONDUCTIVE(GENERIC) | BLACK ONLY |
| E | $10^9$ TO $10^{11}$ | ANTISTATIC(COATED)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

Figure 12.1 Reel Information (for all packages)

**Common size**

| Appearance | Size(mm) |
|------------|-----------|
| E | 1.75±0.10 |
| F | 5.5±0.10 |
| P2 | 2.00±0.10 |
| D0 | 1.55±0.05 |
| D1 | 1.6±0.10 |
| P0 | 4.00±0.10 |
| 10P0 | 40.00±0.20 |

**Pocket size**

| Appearance | Size(mm) |
|------------|-----------|
| W | 12.00±0.30 |
| $P_1$ | 8.00±0.10 |
| $A_o$ | 6.50±0.10 |
| $B_o$ | 5.30±0.10 |
| $K_o$ | 2.20±0.10 |
| $K_1$ | 1.90±0.10 |
| T | 0.30±0.05 |

Direction of Feed

Quadrant
Designations

Figure 12.2 Tape Information of SOP8
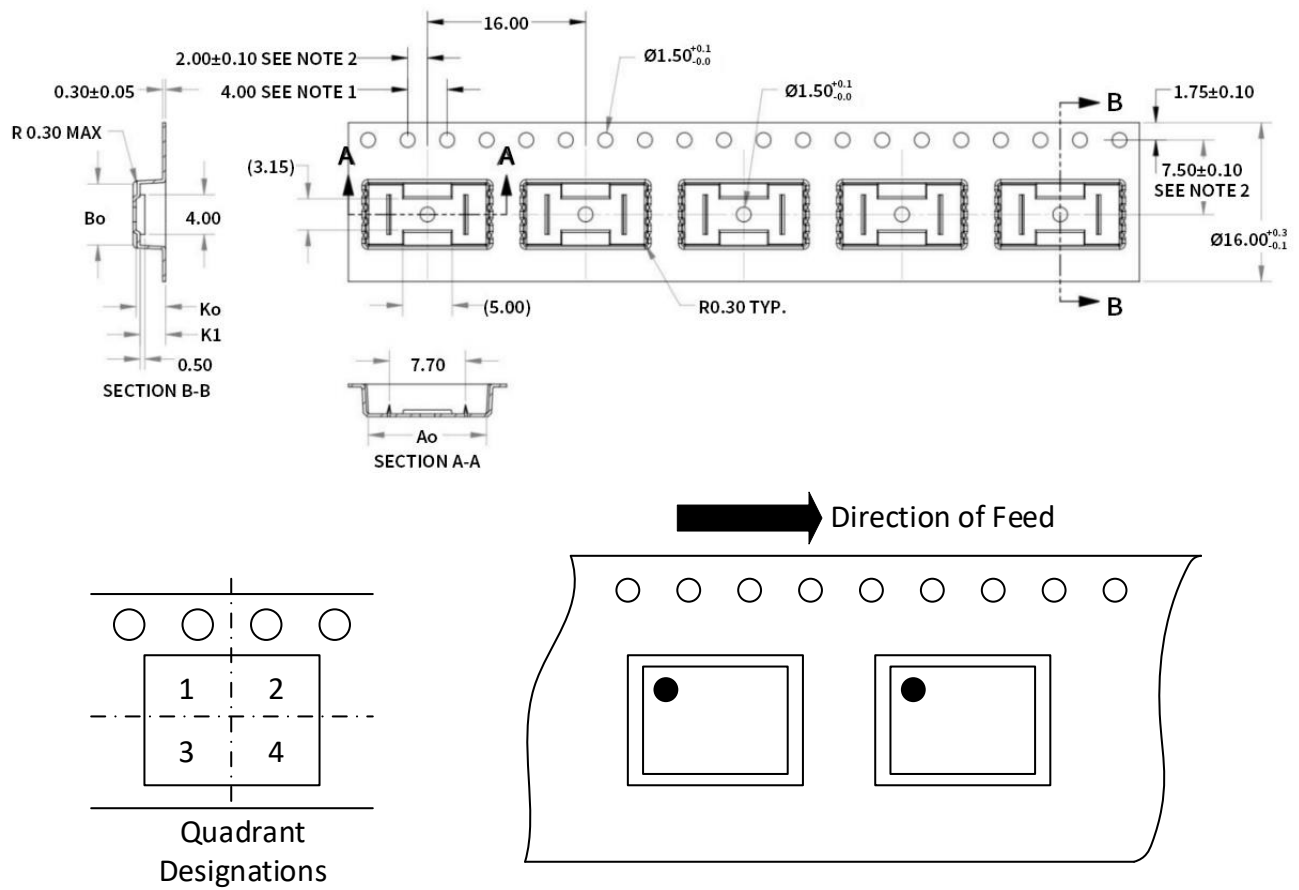
Figure 12.2 Tape Information of SOW8

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.(Rewind N=122 )
7. Component load per 13" reel: 1000 pcs.
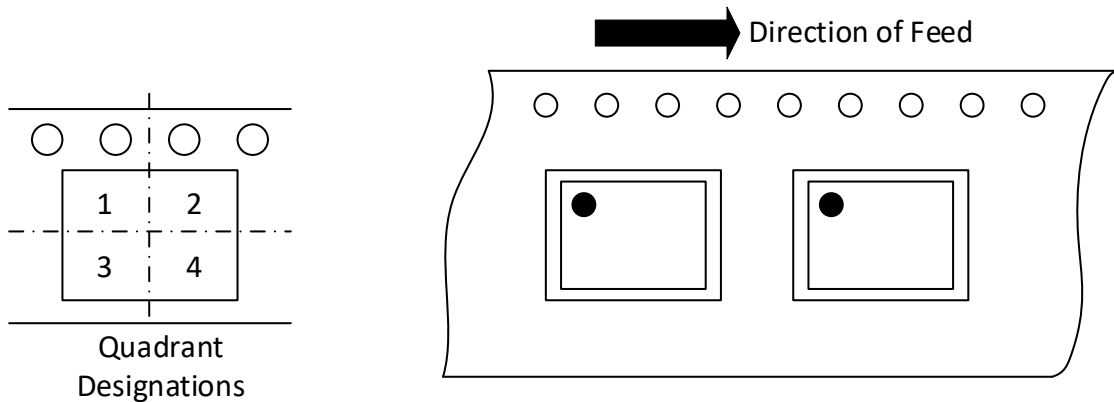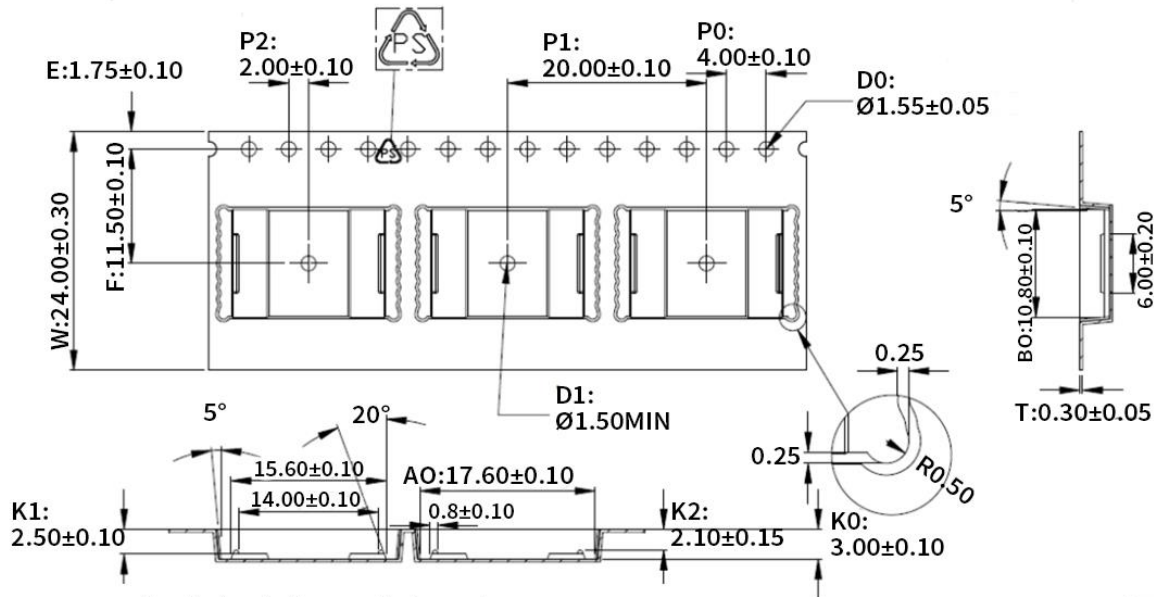8. Surface resistivity:$10^5 \sim 10^{10} \Omega/\square$
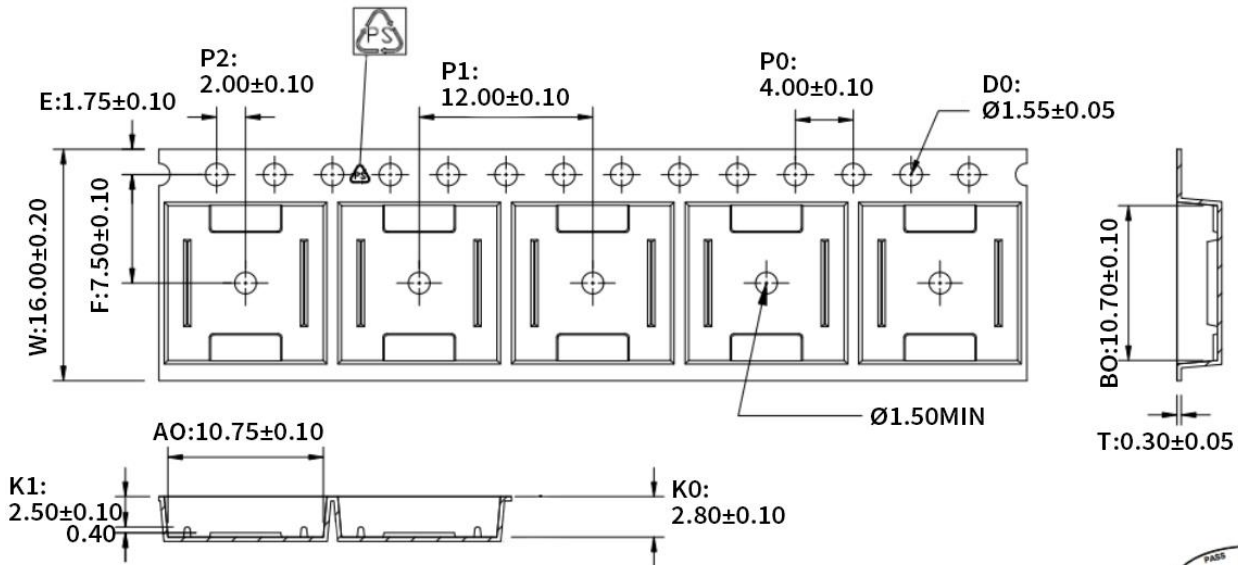
| | |
|---|---|
| W | 16.00±0.20 |
| A0 | 10.75±0.10 |
| B0 | 10.70±0.10 |
| K0 | 2.80±0.10 |
| K1 | 2.50±0.10 |

Figure 12.3 Tape Information of SOW16

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 19" reel: 246.0 Meters.(Rewind 1:13 )
7. Component load per 13" reel: 5000 pcs.
8. Surface resistivity:$10^5$~ $10^{10}\Omega/\square$

| W | 24.00±0.30 |
|---|---|
| A0 | 17.60±0.10 |
| B0 | 10.80±0.10 |
| K0 | 3.00±0.10 |
| K1 | 2.50±0.10 |



Quadrant
Designations

Direction of Feed
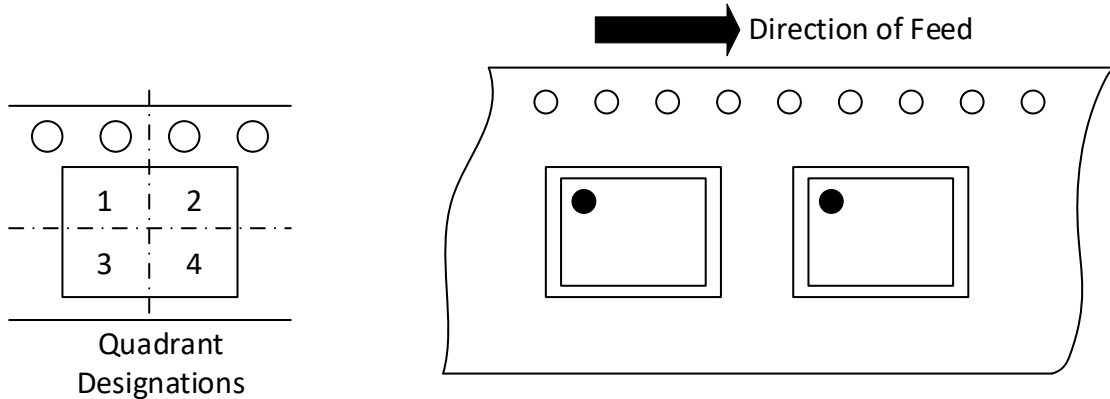
Figure 12.4 Tape Information of SOWW16

## 13. Revision History

| Revision | Description | Date |
|---|---|---|
| 1.0 | Initial version | 2019/12/20 |
| 1.1 | Update SOW8 package PIN description | 2020/6/23 |
| 1.2 | Changed tape and reel information | 2021/2/4 |
| 1.3 | Operating temperature support -55 to 125 ℃ | 2021/7/7 |
| 1.4 | Update SOWW16 package | 2021/12/5 |
| 1.5 | Update Package Board Layout Example. Changed AEC-Q100 description. | 2022/4/16 |
| 1.6 | Update SOWW16 MSL, Pin Configuration and VISO. | 2022/9/30 |

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