

**DATA SHEET**

# Si8931 and Si8932 Isolated Analog Amplifier

## Applications

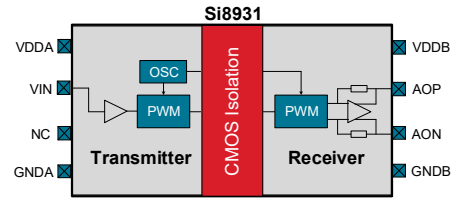
- Industrial, HEV and renewable energy inverters
- AC, brushless, and DC motor controls and drives
- Variable speed motor control in white goods
- Isolated switch mode and UPS power supplies
- General industrial data acquisition and sensor interface
- Automotive on-board chargers, battery management systems, and charging stations

## Features

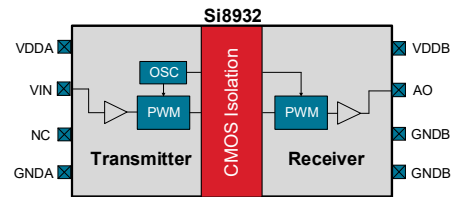
- 0 to 2.5 V nominal input voltage
- Low signal delay: 1  $\mu$ s
- Typical input offset: 0.16 mV
- Typical gain error:  $\pm$ 0.06%
- Excellent drift specifications
  - 0.75  $\mu$ V/ $^{\circ}$ C offset drift
  - 6 ppm/ $^{\circ}$ C typical gain drift
- Typical nonlinearity: 0.01%
- Typical SNR: 76 dB
- High common-mode transient immunity: 75 kV/ $\mu$ s
- Automotive-grade OPNs available
  - AEC-Q100 qualification
  - AIAG-compliant PPAP documentation support
  - IMDS and CAMDS listing support
- Compact packages
  - 8-pin wide body stretched SOIC
  - 8-pin narrow body SOIC
- -40 to 125  $^{\circ}$ C

## Safety Approvals

- UL 1577 recognized
  - Up to 5000 kV<sub>RMS</sub> for 1 minute
- CSA approval
  - IEC 62368-1 (reinforced insulation)
- VDE certification conformity
  - EN62368-1 (reinforced insulation)
  - Pending IEC60747-17 (basic/reinforced insulation)
- CQC certification approval
  - GB4943.1-2011, GB4943.1-2022



**Figure 1. Si8931 Block Diagram**



**Figure 2. Si8932 Block Diagram**

## Description

The Si8931 and Si8932 galvanically isolated analog amplifiers feature 2.5 V input range and are optimized for isolated voltage sensing applications. The output is a differential analog signal (Si8931) or a single-ended signal (Si8932) proportional to the input voltage.

The Si8931/32 provide excellent linearity with low offset and gain drift to maintain accuracy over the entire operating temperature range. Exceptionally high common-mode transient immunity ensures the Si8931/32 deliver accurate measurements even in the presence of high-power switching in motor drive systems and inverters.

The Si8931/32 isolated voltage sensing amplifier utilizes Skyworks proprietary isolation technology, and withstands up to 5.0 kV<sub>RMS</sub> per UL1577. This technology enables high performance, reduced variation with temperature and age, tighter part-to-part matching, and longer lifetimes compared to other isolation technologies.

Automotive Grade is available for certain part numbers. These products are built using automotive-specific flows at all steps in the manufacturing process to ensure the robustness and low defectivity required for automotive applications.



Skyworks Green<sup>™</sup> products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green<sup>™</sup>*, document number SQ04-0074.

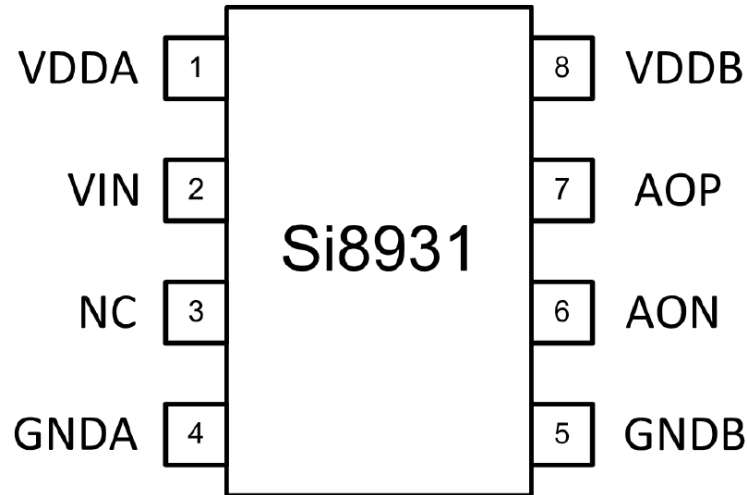


Figure 3. Si8931 Pinout (Top View)

Table 1. Si8931 Pin Descriptions

Name	Pin Number	Description
VDDA	1	Input side power supply
VIN	2	Voltage input
NC <sup>1</sup>	3	No Connect
GNDA	4	Input side ground
GNDB	5	Output side ground
AON	6	Analog output low
AOP	7	Analog output high
VDDB	8	Output side power supply

1. No Connect. These pins are not internally connected. To maximize CMTI performance, these pins should be connected to the ground plane.

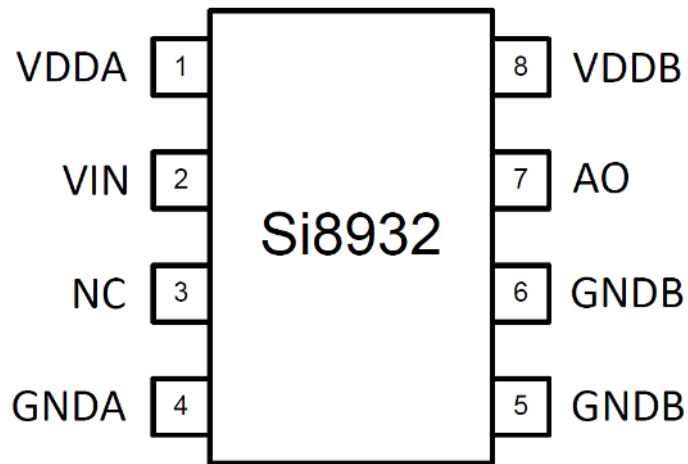


Figure 4. Si8932 Pinout (Top View)

Table 2. Si8932 Pin Descriptions

Name	Pin Number	Description
VDDA	1	Input side power supply
VIN	2	Voltage input
NC <sup>1</sup>	3	No Connect
GNDA	4	Input side ground
GNDB <sup>2</sup>	5	Output side ground
GNDB <sup>2</sup>	6	Output side ground
AO	7	Analog output
VDDB	8	Output side power supply

1. No Connect. These pins are not internally connected. To maximize CMTI performance, these pins should be connected to the ground plane.
2. Both pin 5 and pin 6 must be connected to ground.

## Technical Description

The Si8931/32 are designed for 0 to 2.5 V nominal input.

The Si8931/32 modulates the analog signal in a unique way for transmission across the semiconductor based isolation barrier. The input signal is first converted to a pulse-width modulated digital signal. On the other side of the isolation barrier, the signal is demodulated to faithfully reproduce the analog signal. This solution provides exceptional signal bandwidth and accuracy. The Si8931 provides a differential voltage output while the Si8932 provides a single-ended voltage output.

## Fail-Safe and Low-Power Modes

The Si8931/32 implements a fail-safe output when the high-side supply voltage VDDA goes away. This is important for safe operation in systems with high safety requirements. The fail-safe output is nominally 2.8 V (Si8932) or  $\pm 2.8$  V (Si8931) which can be differentiated from the maximum clipping output voltage of 2.6 V to simplify diagnostics on the system level.

**Table 3. Si8931 and Si8932 Output Voltages**

Device	Output Voltage (VDDA Normal)	Output Voltage (VDDA Removed)
Si8931	$\sim \pm 2.6$ V	$\sim -2.8$ V
Si8932	0 to $\sim 2.6$ V	$\sim +2.8$ V

In addition to the fail-safe output, when a loss of VDDA supply occurs, the part will automatically move into a lower power mode that reduces IDDB current to approximately 1 mA. The controller side continues to monitor high-side communications to determine when VDDA supply returns. When the supply voltage is returned, normal operation begins in approximately 250  $\mu$ s. Similarly, a loss of VDDB supply will reduce IDDA current to approximately 1 mA.

## Voltage Sense Application

A typical isolated voltage sensing application circuit is shown below. In this example, a high voltage is divided down to produce a voltage (VIN) within the optimum input signal range of the Si8931/32. Numerous alternative inputs configurations are possible with the flexibility of a high impedance input isolator. The Si8931 senses the single-ended input voltage and reproduces it as a differential (or single-ended with the Si8932) output voltage across the galvanic isolation barrier. The Si8931 differential outputs (AOP, AON) can be routed directly to a differential ADC as shown below. The Si8932 senses the single-ended input voltage and reproduces it as a single-ended output voltage across the galvanic isolation barrier. The single-ended output can be routed directly to a standard ADC (not shown). If the voltage sensed is  $> 2.5$  V, a simple voltage divider consisting of R1 and R2 can be used to scale down any voltage to fit the input range of the Si8931/32.  $R2 < 10$  k $\Omega$  is recommended for best performance.

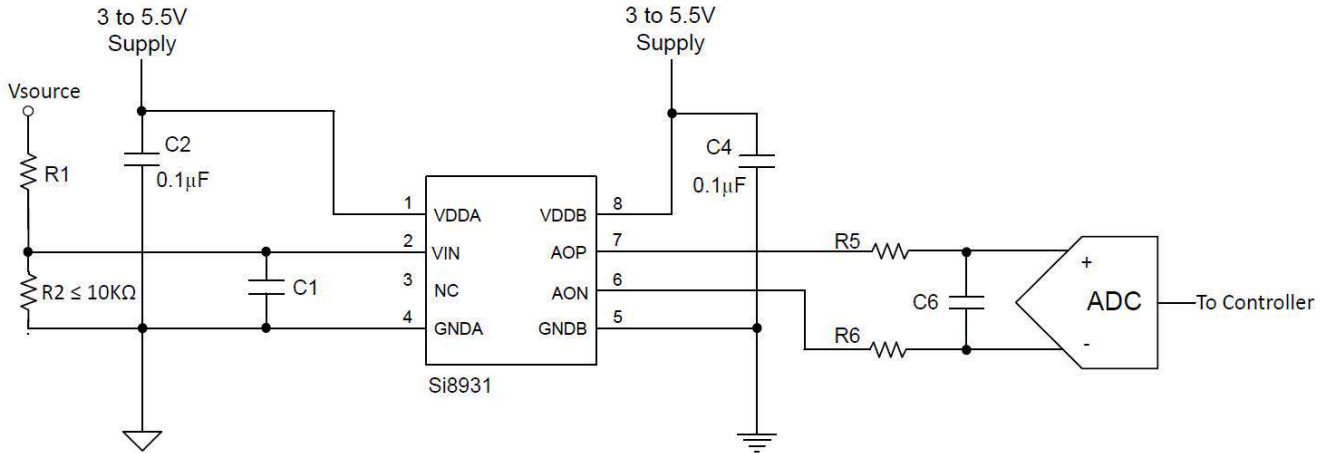


Figure 5. Voltage Sense Application

The amplifier bandwidth of the Si8931/32 is approximately 600 kHz. For applications where input filtering is required, a passive, differential RC low-pass filter can be placed at the input pin. Consider the source resistance of the signal measured (or the parallel combination of R1 and R2 if using a voltage divider) as it should be included in the filter calculation. Capacitor C1 should be sized to make a band limiting filter at the desired frequency.

The local bypass capacitor C4 for the B-side of Si8931/32, should be placed closed to VDDB supply pin with its return close to GNDB. The output signal at AOP and AON is differential with unity gain and common mode of 1.4 V. The outputs are sampled by a differential input ADC. Depending on the sample rate of the ADC, an anti-aliasing filter may be required. A simple anti-aliasing filter can be made from the passive components, R5, C6, and R6. The characteristics of this filter are dictated by the input topology and sampling frequency of the ADC.

However, to ensure the Si8931/32 outputs are not overloaded,  $R5 = R6 > 5 \text{ k}\Omega$  and C6 can be calculated by the following equation:

$$C6 = \frac{1}{2 \times \pi \times (R5 + R6) \times f_{3dB}}$$

## Electrical and Mechanical Specifications

The absolute maximum ratings of the Si8931 and Si8932 are provided below, followed by electrical specifications, performance graphs, and mechanical specifications.

**Table 4. Si8931 and Si8932 Absolute Maximum Ratings<sup>1</sup>**

Parameter	Symbol	Min	Max	Unit
Storage temperature	T <sub>STG</sub>	-65	150	°C
Ambient temperature under bias	T <sub>A</sub>	-40	125	°C
Junction temperature	T <sub>J</sub>		150	°C
Supply voltage	V <sub>DDA</sub> , V <sub>DDDB</sub>	-0.5	6.0	V
Input voltage respect to GNDA	V <sub>IN</sub>	-0.5	V <sub>DDA</sub> + 0.5	V
Output sink or source current	I <sub>o</sub>		5	mA
Total power dissipation	P <sub>T</sub>		212	mW
Lead solder temperature (10 s)			260	°C
Human Body Model ESD rating		6000		V
Charged Device Model ESD rating		2000		V

1. Note: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

---

**ESD Handling: Industry-standard ESD handling precautions must be adhered to at all times to avoid damage to this device.**

---

Table 5. Si8931 and Si8932 Electrical Specifications<sup>1</sup>

TA = -40 to +125 °C; typical specs at 25 °C with VDDA = VDDB = 5 V unless specified differently under Test Condition							
Parameter	Symbol	Test Condition	Min	Typ	Max	Units	
Input side supply voltage	VDDA		3.0		5.5	V	
Input supply current	Si8931/32	IDDA	VDDA = 3.3 V	3.5	4.7	5.7	mA
Output side supply voltage	VDDB		3.0		5.5	V	
Output supply current	Si8931	IDDB	VDDB = 3.3 V	2.6	3.5	4.5	mA
	Si8932	IDDB	VDDB = 3.3 V	2.6	4.3	5	mA
Amplifier Bandwidth				600		kHz	
<b>Amplifier Input</b>							
Specified linear input range	VIN		0.25		2.25	V	
Maximum input voltage before clipping	VIN			2.5		V	
Input referred offset	VOS	TA = 25 °C, VIN = 0.25 V	-1	±0.16	1	mV	
Input offset drift	VOST		-25	±0.75	25	µV/°C	
Input impedance	RIN			500		MΩ	
<b>Amplifier Output</b>							
Full-scale output				2.5		Vpk	
Gain				1			
Gain error		TA = 25 °C	-0.25	±0.06	0.25	%	
Gain error drift	Si8931		-40	6	20	ppm/°C	
	Si8932		-30	-5	30	ppm/°C	
Output Common Mode Voltage	Si8931	(VAOP + VAON)/2	1.34	1.39	1.44	V	
Nonlinearity	Si8931	TA = 25 °C	-0.04	0.01	0.04	%	
	Si8932	TA = 25 °C	-0.05	0.01	0.05	%	
Nonlinearity drift		TA = 25 °C	-5		5	ppm/°C	
Signal-to-noise ratio	Si8931	SNR	100 kHz bandwidth	73	77		dB
	Si8932	SNR	100 kHz bandwidth	72	76		dB
Total harmonic distortion	Si8931	THD	FIN = 1 kHz		-80	-60	dB
	Si8932	THD	FIN = 1 kHz		-80	-60	dB

Table 5. Si8931 and Si8932 Electrical Specifications<sup>1</sup> (Continued)

TA = -40 to +125 °C; typical specs at 25 °C with VDDA = VDDB = 5 V unless specified differently under Test Condition							
Parameter		Symbol	Test Condition	Min	Typ	Max	Units
Power Supply Rejection Ratio		PSRR	VDDA at DC		-100		dB
Power Supply Rejection Ratio		PSRR	VDDA at 100 mV and 10 kHz ripple		-100		dB
			VDDB at DC		-100		dB
			VDDB at 100 mV and 10 kHz ripple		-100		dB
Output Resistive Load	Si8931	RLOAD	Between AON and AOP	5			kΩ
	Si8932		Between AO and GND	5			kΩ
Output capacitive load		CLOAD	Each pin to ground			100	pF
<b>Timing</b>							
Signal delay		t <sub>PD</sub>	50% to 50%				μs
Rise time		t <sub>R</sub>	10% to 90%				μs
Common-mode transient immunity <sup>2</sup>		CTMI	VIN = GNDA, VCM = 1500 V				kV/μs

1. Performance is guaranteed only under the conditions listed in this Table and is not guaranteed over the full operating or storage temperature ranges. Operation at elevated temperatures may reduce reliability of the device.
2. An analog CMTI failure is defined as an output error of more than 100 mV persisting for at least 1 μs.

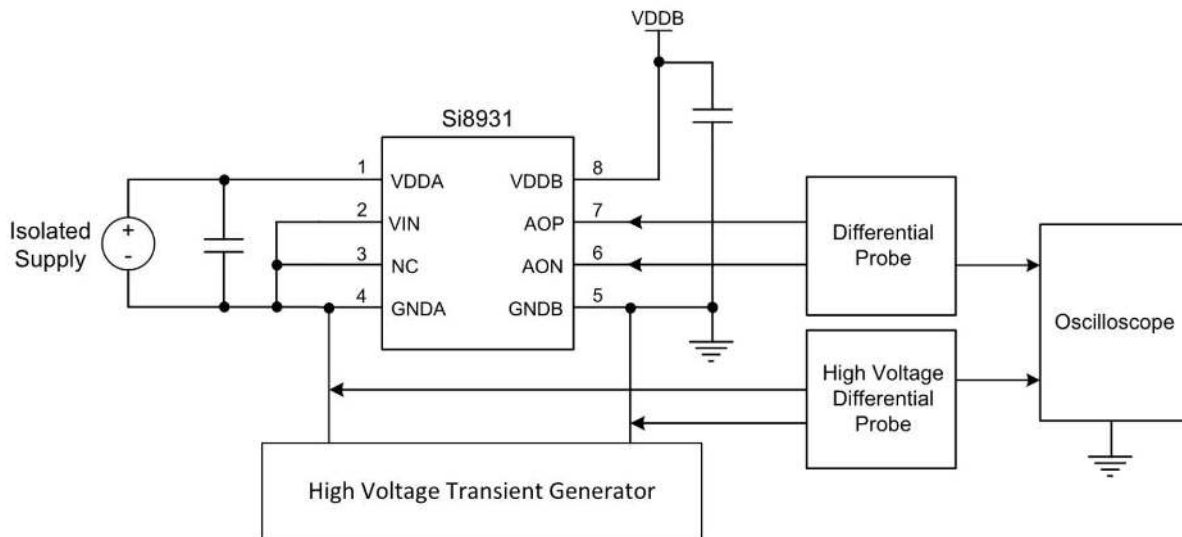


Figure 6. Common-Mode Transient Immunity Characterization Circuit



Table 6. IEC 60747-17 Safety Limiting Values<sup>1</sup>

Parameter	Symbol	Test Condition	Characteristic	Unit
Safety temperature	$T_S$		150	°C
Safety input current (WB stretched SOIC-8)	$I_S$	$\theta_{JA} = 90\text{ °C/W}$ VDD = 5.5 V $T_J = 150\text{ °C}$ $T_A = 25\text{ °C}$	253	mA
		$\theta_{JA} = 90\text{ °C/W}$ VDD = 3.6 V $T_J = 150\text{ °C}$ $T_A = 25\text{ °C}$	386	mA
Safety input current (NB SOIC-8)	$I_S$	$\theta_{JA} = 112\text{ °C/W}$ VDD = 5.5 V $T_J = 150\text{ °C}$ $T_A = 25\text{ °C}$	203	mA
		$\theta_{JA} = 112\text{ °C/W}$ VDD = 3.6 V $T_J = 150\text{ °C}$ $T_A = 25\text{ °C}$	310	mA
Safety input power (WB stretched SOIC-8)	$P_S$	$\theta_{JA} = 90\text{ °C/W}$ $T_J = 150\text{ °C}$ $T_A = 25\text{ °C}$	1389	mW
Safety input power (NB SOIC-8)	$P_S$	$\theta_{JA} = 112\text{ °C/W}$ $T_J = 150\text{ °C}$ $T_A = 25\text{ °C}$	1116	mW

1. Maximum value allowed in the event of a failure. Refer to the thermal derating curves below.

Table 7. Thermal Characteristics

Parameter	Symbol	WB Stretched SOIC-8	NB SOIC-8	Unit
IC Junction-to-air thermal resistance	$\theta_{JA}$	90	112	$^{\circ}\text{C}/\text{W}$

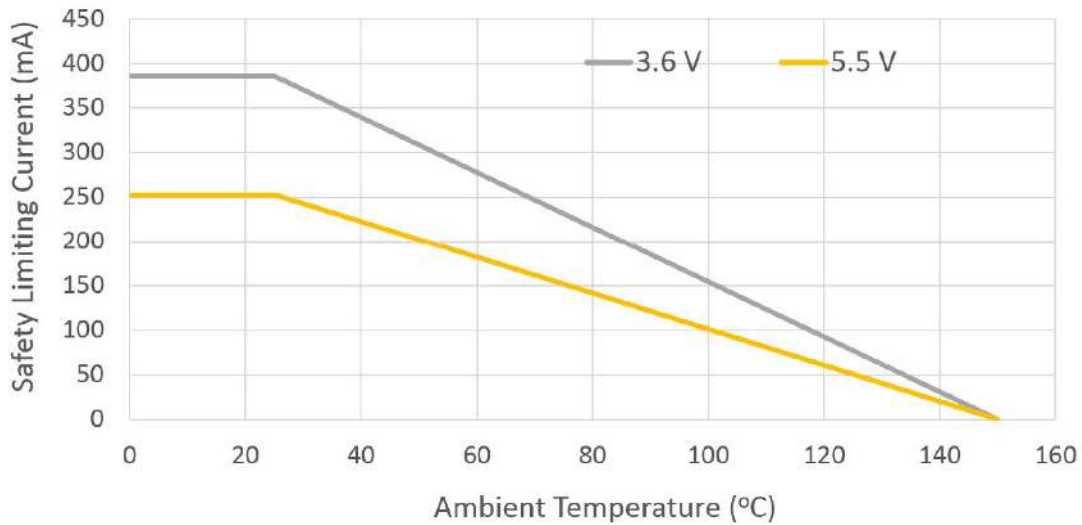


Figure 7. WB Stretched SOIC-8 Thermal Derating Curve for Safety Limiting Current

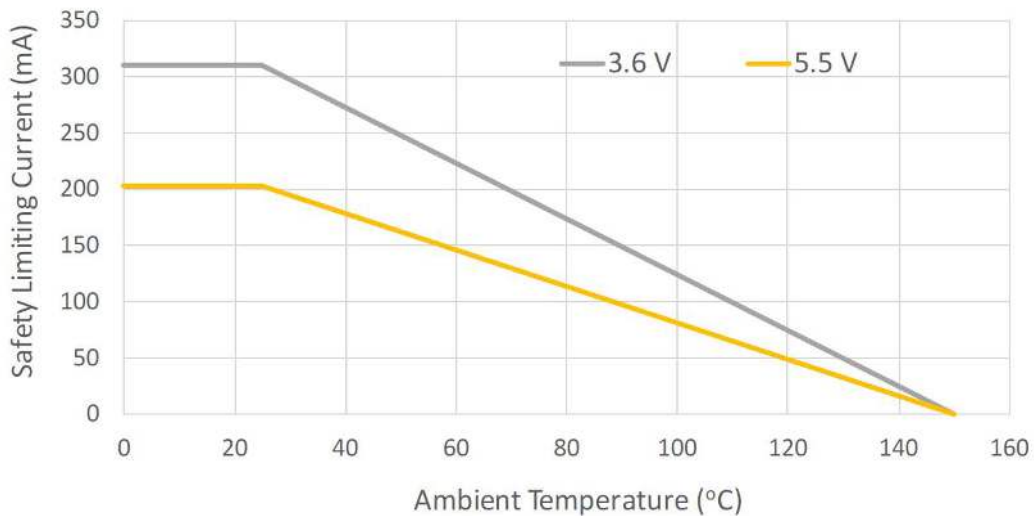


Figure 8. NB SOIC-8 Thermal Derating Curve for Safety Limiting Current

Typical Performance Characteristics

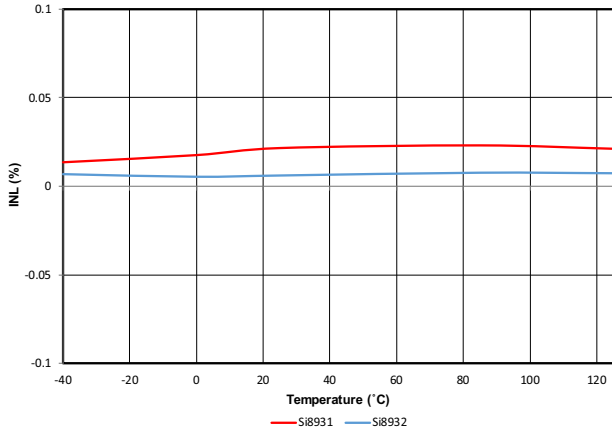


Figure 9. Nonlinearity (%) vs. Temperature (°C)

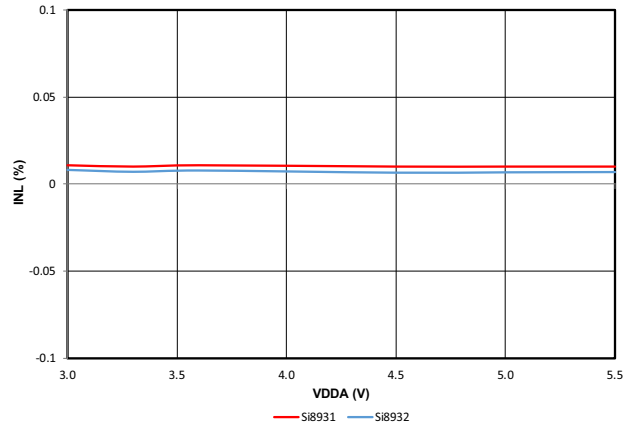


Figure 10. Nonlinearity (%) vs. VDDA Supply (V)

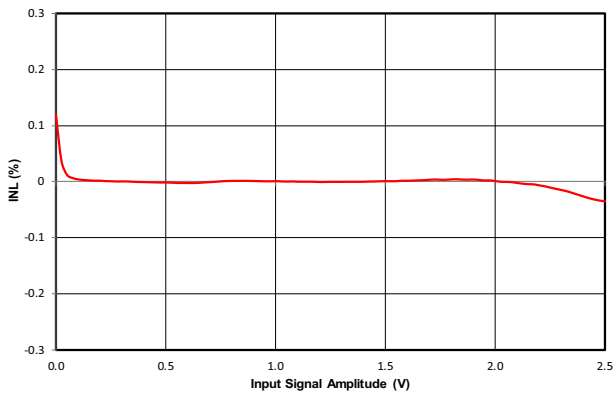


Figure 11. Si8931 Nonlinearity (%) vs. Input Signal Amplitude (mV)

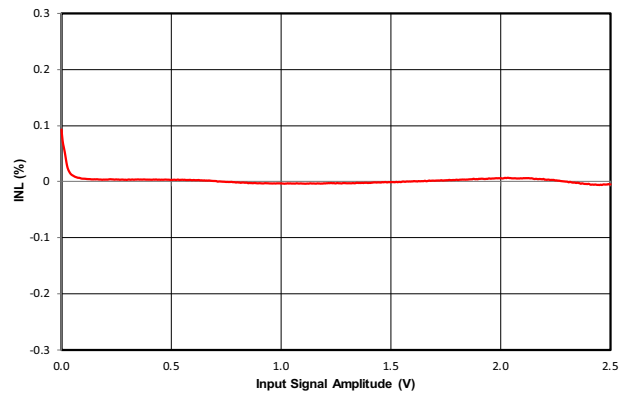


Figure 12. Si8932 Nonlinearity (%) vs. Input Signal Amplitude (mV)

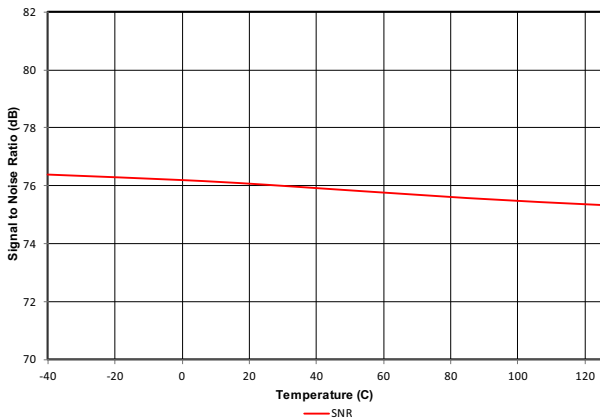


Figure 13. Signal-to-Noise Ratio (dB) vs. Temperature (°C)

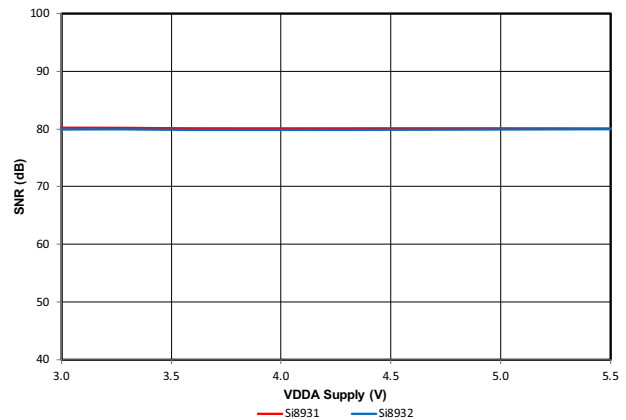


Figure 14. Signal-to-Noise Ratio (dB) vs. VDDA Supply (V)

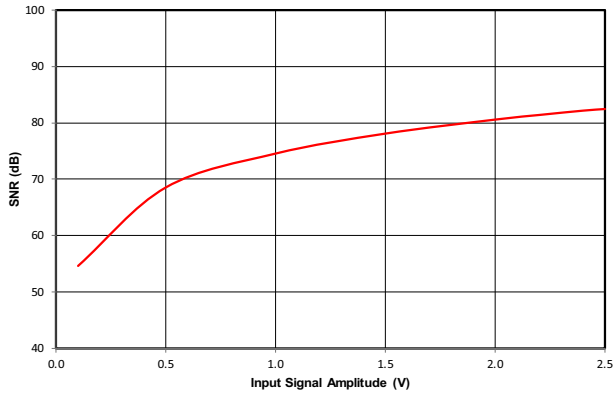


Figure 15. Si8931 Signal-to-Noise Ratio (dB) vs. Input Signal Amplitude (V)

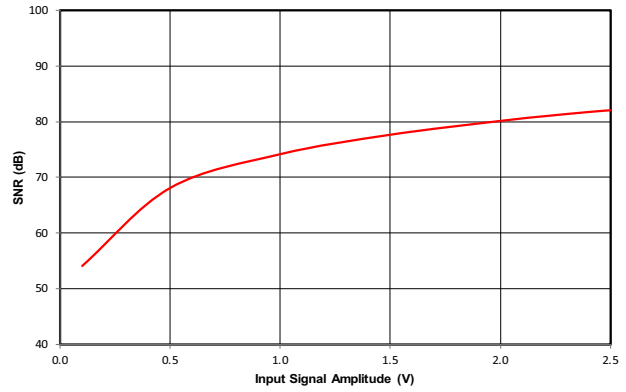


Figure 16. Si8932 Signal-to-Noise Ratio (dB) vs. Input Signal Amplitude (V)

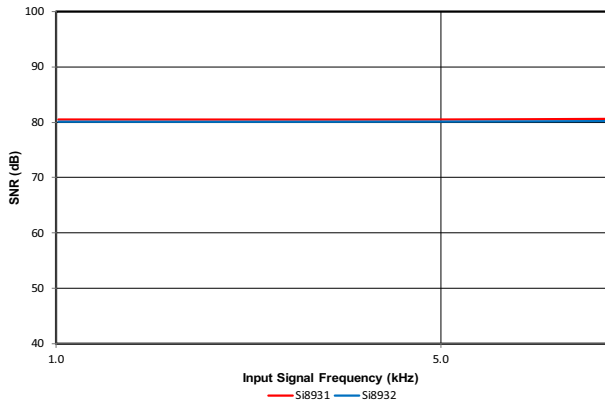


Figure 17. Signal-to-Noise Ratio (dB) vs. Input Signal Frequency (kHz)

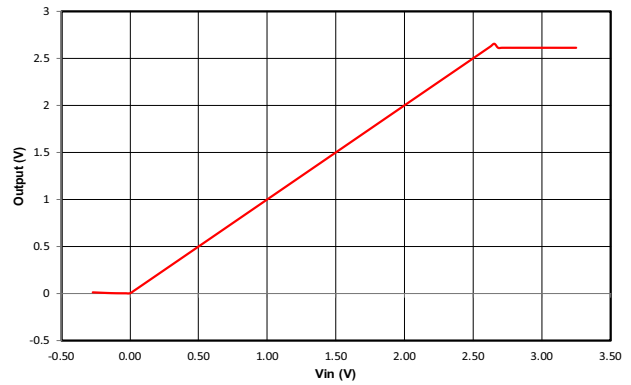


Figure 18. Output Voltage (V) vs. Input Voltage (V)

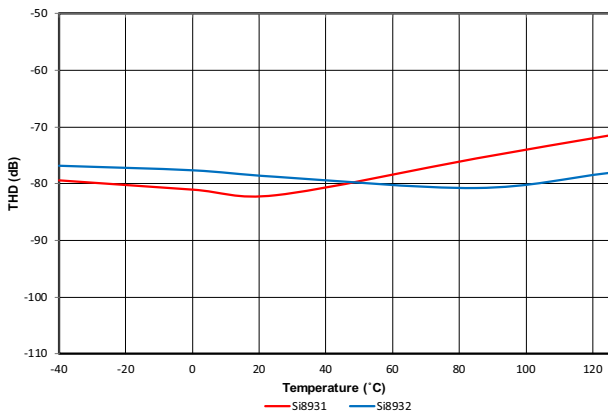


Figure 19. Total Harmonic Distortion (dB) vs. Temperature (°C)

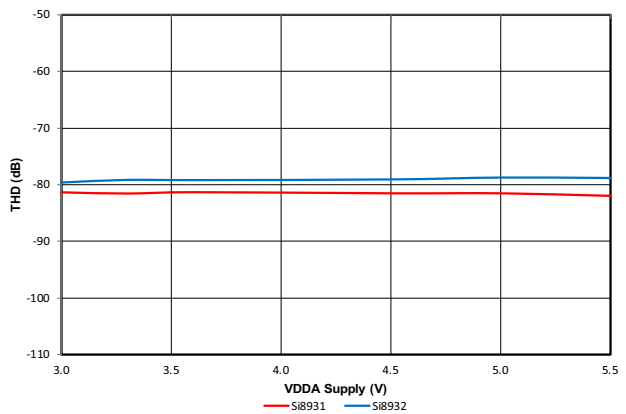


Figure 20. Total Harmonic Distortion (dB) vs. VDDA Supply (V)

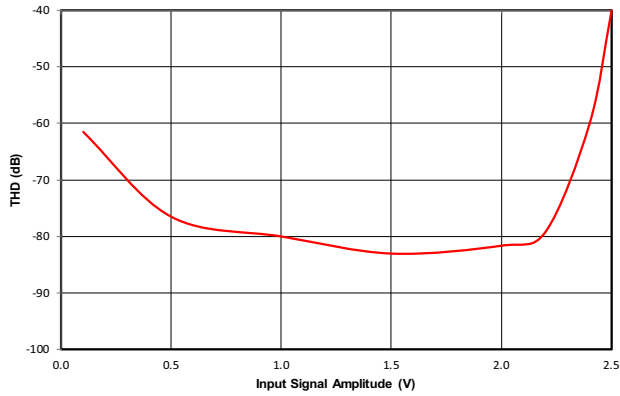


Figure 21. Si8931 Total Harmonic Distortion (dB) vs. Input Signal Amplitude (V)

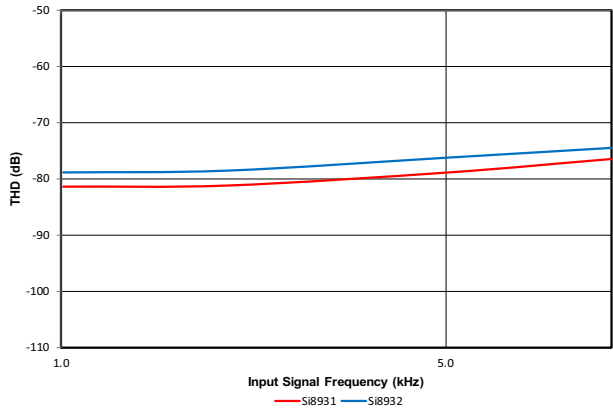


Figure 22. Total Harmonic Distortion (dB) vs. Input Signal Frequency (kHz)

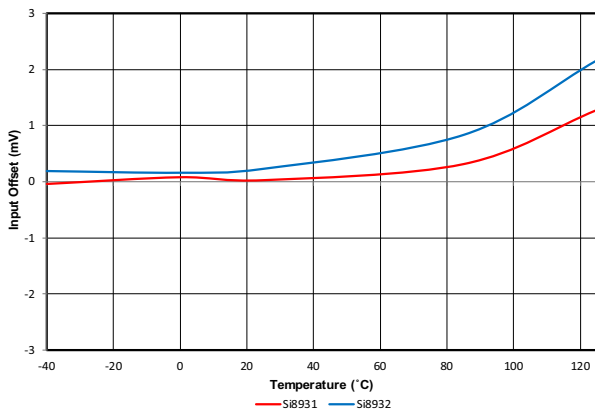


Figure 23. Input Offset (mV) vs. Temperature (°C)

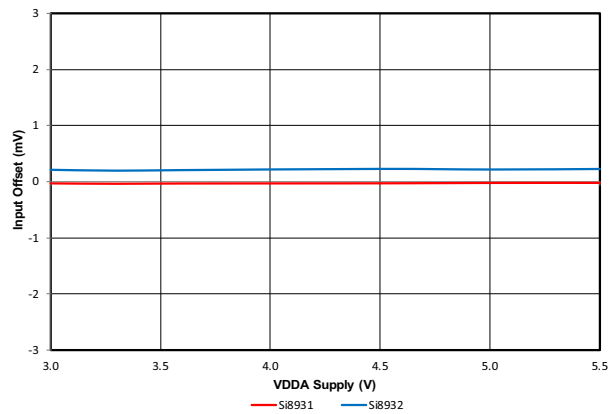


Figure 24. Input Offset (mV) vs. VDDA Supply (V)

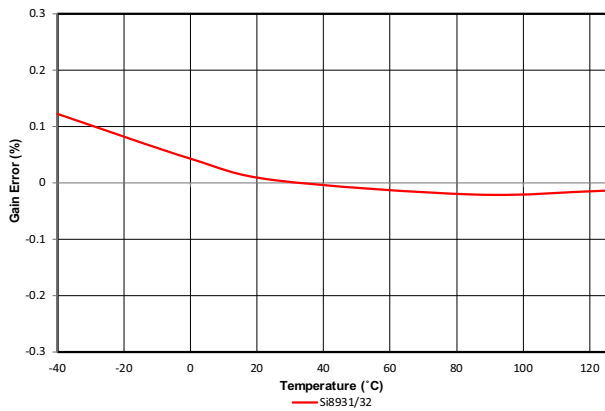


Figure 25. Gain Error (%) vs. Temperature (°C)

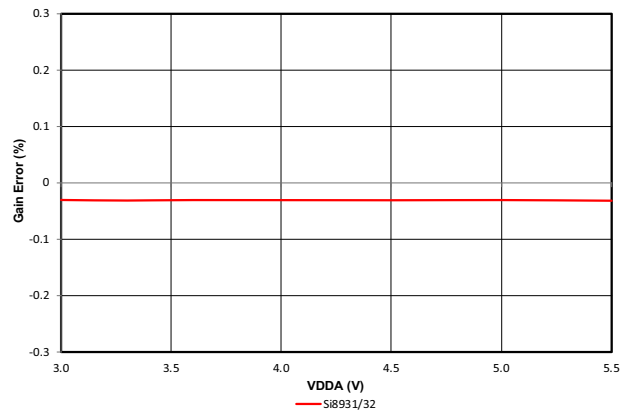


Figure 26. Gain Error (%) vs. VDDA Supply (V)

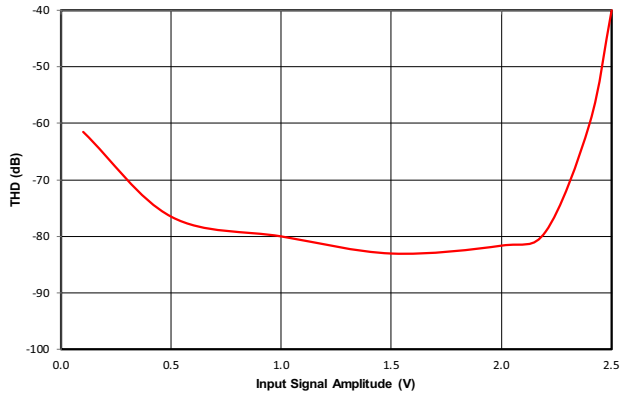


Figure 27. IDDA (mA) vs. Temperature (°C)

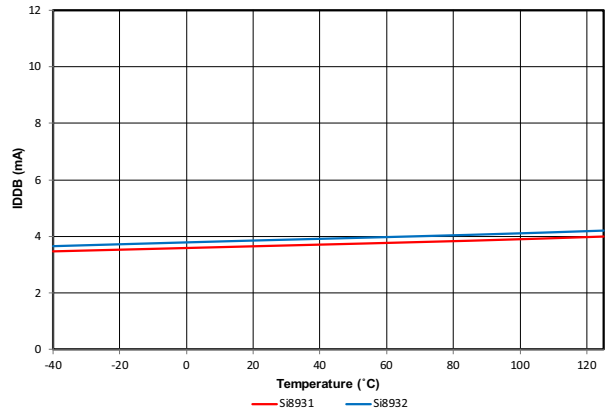


Figure 28. IDDB (mA) vs. Temperature (°C)

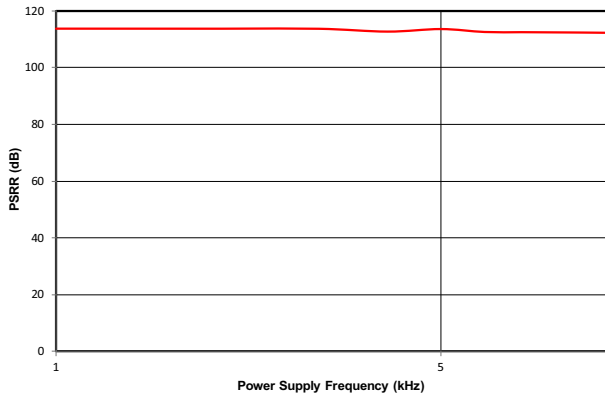


Figure 29. PSRR (dB) vs. Power Supply Frequency (kHz)

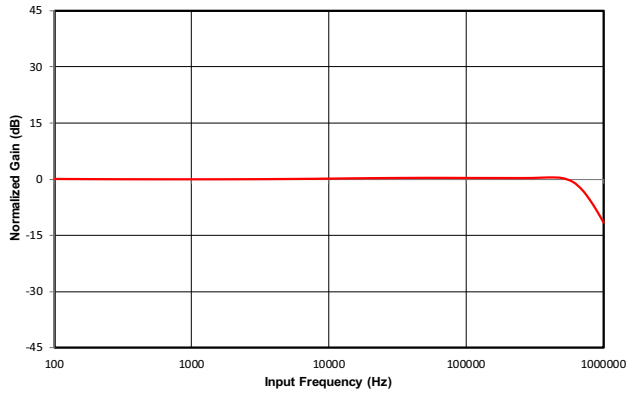


Figure 30. Amplifier Bandwidth

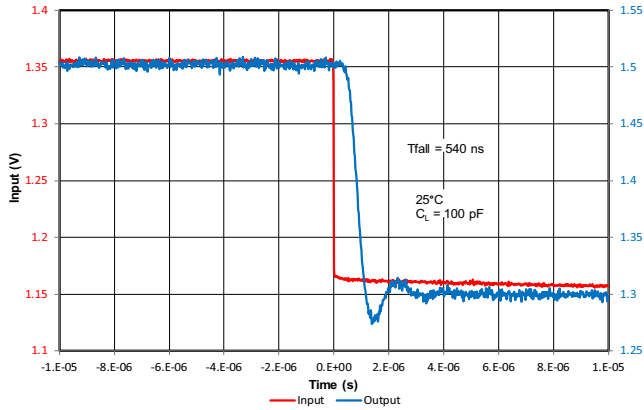


Figure 31. Si8931 High-to-Low Step Response

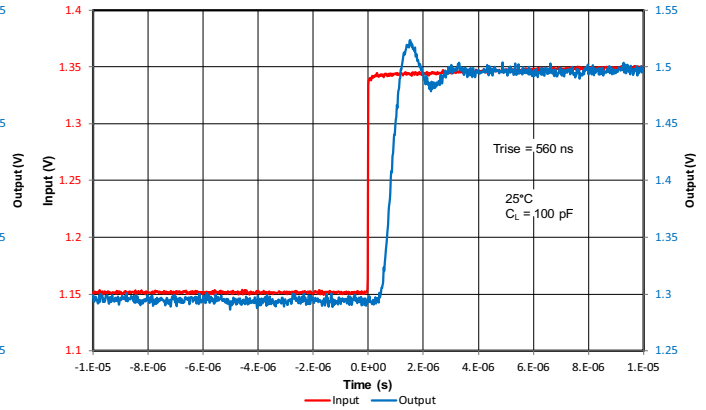


Figure 32. Si8931 Low-to-High Step Response

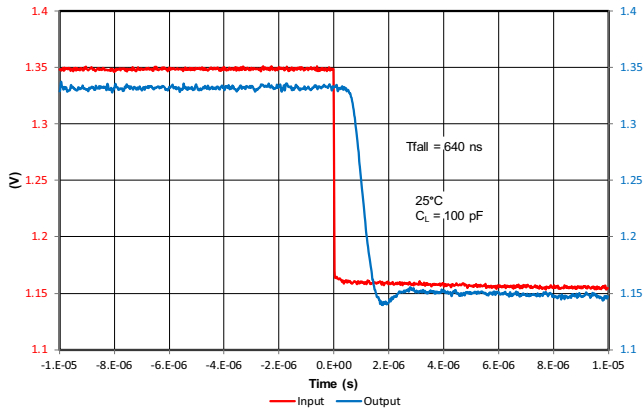


Figure 33. Si8932 High-to-Low Step Response

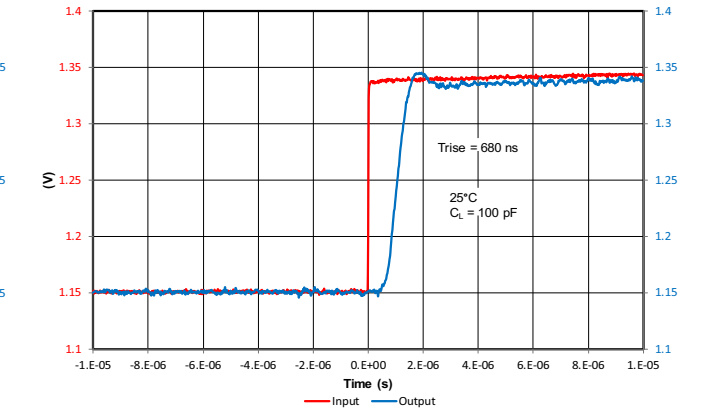


Figure 34. Si8932 Low-to-High Step Response

## Regulatory Information

**Table 8. Regulatory Information<sup>1, 2</sup>**

<b>CSA</b>
The Si8931/32 is certified under CSA. For more details, see Master Contract File 232873.
62368-1: Up to 600 V <sub>RMS</sub> reinforced insulation working voltage; up to 1000 V <sub>RMS</sub> basic insulation working voltage.
<b>VDE</b>
The Si8931/32 is pending certification according to IEC60747-17 and conforms to 62368-1. For more details, see File 5028467.
IEC60747-17: Up to 2121 V <sub>peak</sub> for reinforced insulation working voltage.
EN62368-1: Up to 600 V <sub>RMS</sub> reinforced insulation working voltage; up to 1000 V <sub>RMS</sub> basic insulation working voltage.
<b>UL</b>
The Si8931/32 is certified under UL1577 component recognition program. For more details, see File E257455.
Rated up to 5000 V <sub>RMS</sub> isolation voltage for basic protection.
<b>CQC</b>
The Si8931/32 is certified under GB4943.1-2011 and GB4943.1-2022.
Rated up to 250 V <sub>RMS</sub> reinforced insulation working voltage at 5000 meters.

1. Regulatory Certifications apply to 5 kV<sub>RMS</sub> rated devices which are production tested to 6.0 kV<sub>RMS</sub> for 1 sec.
2. Regulatory Certifications apply to 2.5 kV<sub>RMS</sub> rated devices which are production tested to 3.0 kV<sub>RMS</sub> for 1 sec.

**Table 9. Insulation and Safety-Related Specifications**

Parameter	Symbol	Test Condition	Value		Unit
			WB Stretched SOIC-8	NB SOIC-8	
Nominal external air gap (clearance)	CLR		8.0	4.0	mm
Nominal external tracking (creepage)	CRP		8.0	4.0	mm
Minimum internal gap (internal clearance)	DTI		36	36	μm
Tracking resistance	PTI or CTI	IEC60112	600	600	V
Erosion depth	ED		0.04	0.04	mm
Resistance (input-output) <sup>1</sup>	Rio		10 <sup>12</sup>	10 <sup>12</sup>	Ω
Capacitance (input-output) <sup>1</sup>	Cio	f = 1 MHz	1	1	pF

1. To determine resistance and capacitance, the Si8931/32 is converted into a two-terminal device. Pins 1 to 4 are shorted together to form the first terminal, and pins 5 to 8 are shorted together to form the second terminal. The parameters are then measured between these two terminals.



Table 10. IEC 60664-1 Ratings

Parameter	Test Conditions	Specification	
		WB Stretched SOIC-8	NB SOIC-8
Basic isolation group	Material group	I	I
Installation classification	Rated mains voltages $\leq 150 V_{RMS}$	I-IV	I-IV
	Rated mains voltages $\leq 300 V_{RMS}$	I-IV	I-IV
	Rated mains voltages $\leq 600 V_{RMS}$	I-IV	I-III

Table 11. IEC 60747-17 Insulation Characteristics<sup>1</sup>

Parameter	Symbol	Test Condition	Characteristic		Unit
			WB Stretched SOIC-8	NB SOIC-8	
Maximum working insulation voltage	$V_{IOWM}$		1500	1500	$V_{RMS}$
Maximum repetitive isolation voltage	$V_{IORM}$		2121	2121	Vpeak
Input to output test voltage	$V_{PR}$	Method b1 ( $V_{IORM} \times 1.875 = V_{PR}$ , 100% production test, $t_m = 1$ sec, Partial discharge $< 5$ pC)	3976	3976	Vpeak
Maximum transient isolation overvoltage	$V_{IOTM}$	$t = 60$ sec	8000	4000	Vpeak
Maximum surge isolation voltage	$V_{IOSM}$	Test voltage is $\geq 1.3 \times V_{IMP}$ , minimum 10000 Vpeak and $1.2 \mu s/50 \mu s$	10400	10400	Vpeak
Maximum impulse voltage	$V_{IMP}$		8000	5656	Vpeak
Pollution degree		DIN VDE 0110	2	2	
Insulation resistance	$R_S$	TAMB = TS, $V_{IO} = 500$ V	$>10^9$	$>10^9$	$\Omega$

1. This isolator is suitable for reinforced electrical isolation only within the safety limit data. Maintenance of the safety data is ensured by protective circuits. The Si8931/32 provides a climate classification of 40/125/21.

## Package Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The Si8931D-IS4, Si8931D-AS4, Si8932D-IS4, and Si8932D-AS4 are rated to Moisture Sensitivity Level 2A (MSL2A) at 260°C, while the Si8931B-IS, Si8931B-AS, Si8932B-IS, and Si8932B-AS are rated to MSL2 at 260°C.

They can be used for lead or lead-free soldering. For additional information, refer to Skyworks Application Note, "PCB Design and SMT Assembly/Rework Guidelines," Document Number 101752.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Refer to Standard SMT Reflow Profiles: JEDEC Standard J-STD-020.

Package Outline: 8-Pin Wide Body Stretched SOIC

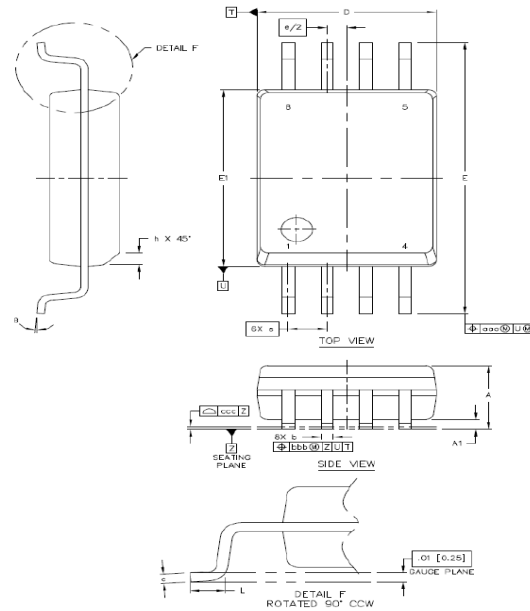


Figure 35. 8-Pin Wide Body Stretched SOIC Package

Table 12. 8-Pin Wide Body Stretched SOIC Package Dimensions

Dimension	Millimeters		Notes
	Min	Max	
A	2.49	2.79	Dimensioning and tolerancing per ANSI Y14.5M-1994. Recommended reflow profile per JEDEC J-STD-020C specification for small body, lead-free components.
A1	0.36	0.46	
b	0.30	0.51	
c	0.20	0.33	
D	5.74	5.94	
E	11.25	11.76	
E1	7.39	7.59	
e	1.27 BSC		
L	0.51	1.02	
h	0.25	0.76	
θ	0°	8°	
aaa		0.25	
bbb		0.25	
ccc		0.10	

Package Outline: 8-Pin Narrow Body SOIC

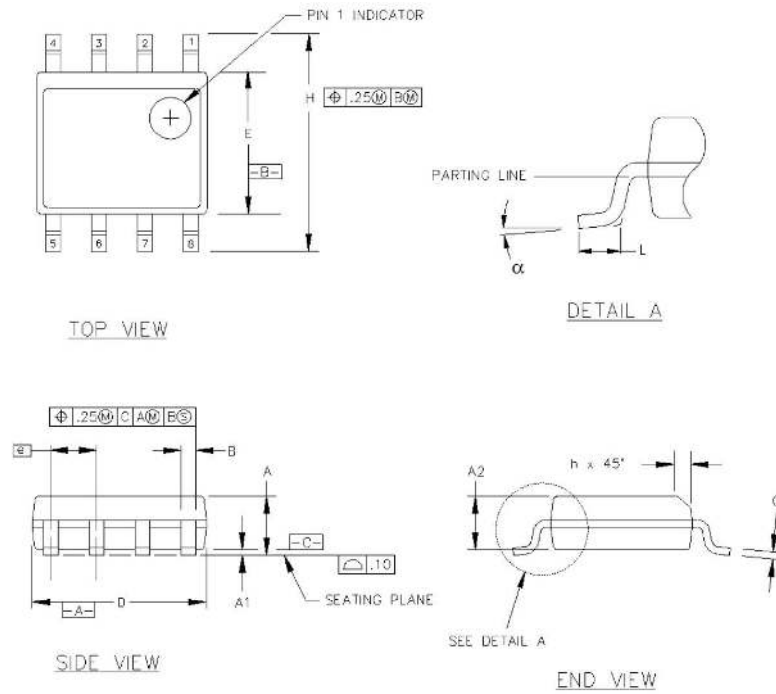


Figure 36. 8-Pin Narrow Body SOIC Package

Table 13. 8-Pin Narrow Body SOIC Package Dimensions

Dimension	Millimeters		Notes
	Min	Max	
A	1.35	1.75	Dimensioning and tolerancing per ANSI Y14.5M-1982.  This drawing conforms to JEDEC Outline MS-012.  Recommended card reflow profile is per the JEDEC/IPC J-STD-020B specification for small body components.
A1	0.10	0.25	
A2	1.40 REF	1.55 REF	
B	0.33	0.51	
C	0.19	0.25	
D	4.80	5.00	
E	3.80	4.00	
e	1.27 BSC		
H	5.80	6.20	
h	0.25	0.50	
L	0.40	1.27	
α	0°	8°	

## Land Pattern: 8-Pin Wide Body Stretched SOIC

### General Guidelines

1. All dimensions shown are at Maximum Material Condition (MMC). Least Material Condition (LMC) is calculated based on a fabrication allowance of 0.05 mm.
2. This land pattern design is based on the IPC-7351 guidelines.

### Solder Mask Design

1. All metal pads are to be non-solder mask defined (NSMD).
2. Clearance between the solder mask and the metal pad is to be 60  $\mu\text{m}$  minimum, all the way around the pad.

### Stencil Design

1. A stainless steel, laser-cut and electro-polished stencil with trapezoidal walls should be used to assure good solder paste release.
2. The stencil thickness should be 0.125 mm (5 mils).
3. The ratio of stencil aperture to land pad size should be 1:1 for all perimeter pins.

### Card Assembly

1. A No-clean, Type-3 solder paste is recommended.
2. The recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.

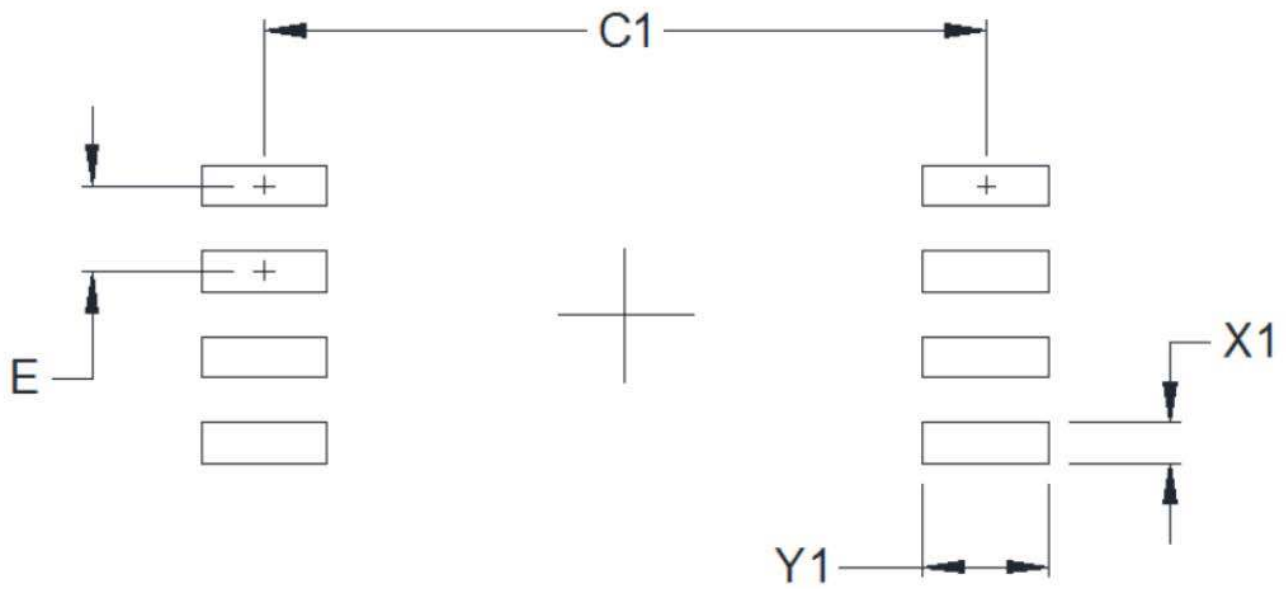


Figure 37. 8-Pin Wide Body Stretched SOIC Land Pattern

Table 14. 8-Pin Wide Body Stretched SOIC Land Pattern Dimensions<sup>1</sup>

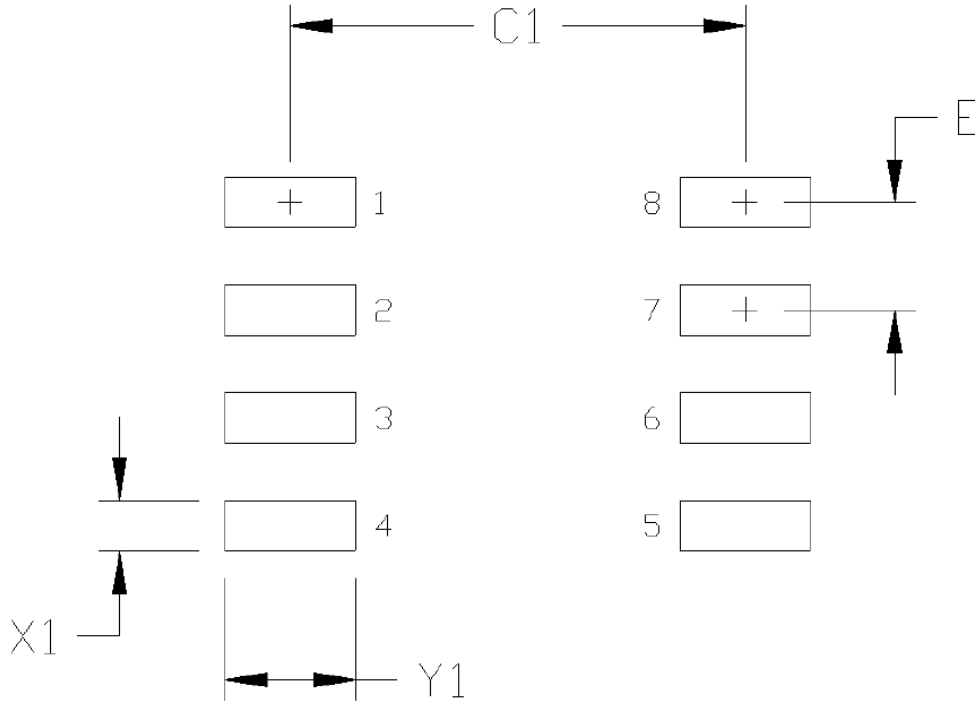
Dimension	(mm)
C1	10.60
E	1.27
X1	0.60
Y1	1.85

1. See General Guidelines

**Land Pattern: 8-Pin Narrow Body SOIC**

**General Guidelines**

1. All feature sizes shown are at Maximum Material Condition (MMC) and a card fabrication tolerance of 0.05 mm is assumed.
2. This Land Pattern Design is based on IPC-7351 pattern SOIC127P600X173-8N for Density Level B (Median Land Protrusion).



**Figure 38. 8-Pin Narrow Body SOIC Land Pattern**

**Table 15. 8-Pin Narrow Body SOIC Land Pattern Dimensions<sup>1</sup>**

Dimension	mm
C1	5.40
E	1.27
X1	0.60
Y1	1.55

1. See General Guidelines

Top Marking: 8-Pin Wide Body Stretched SOIC



Figure 39. Si8931/32 Typical Package Marking, 8-Pin Wide Body Stretched SOIC

Table 16: 8-Pin Wide Body Stretched SOIC Top Marking Explanation

Line 1	Part Number	Si893x X = Base part number 1 = Differential output 2 = Single-ended output  V = Insulation rating: D = 5.0 kV <sub>RMS</sub>
Line 2	TTTTTT	Manufacturing Code
Line 3	YY = Year WW = Work Week Circle = 43 mils diameter left justified	Year and work week



Top Marking: 8-Pin Narrow Body SOIC

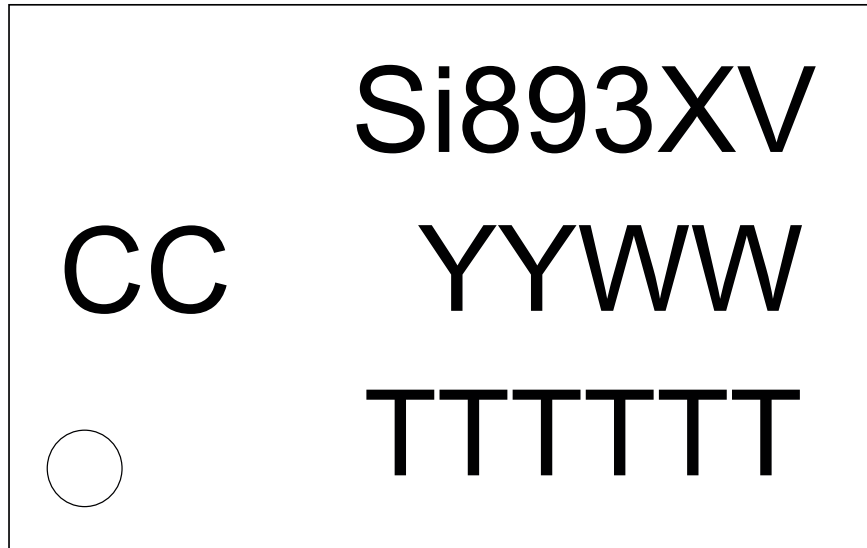
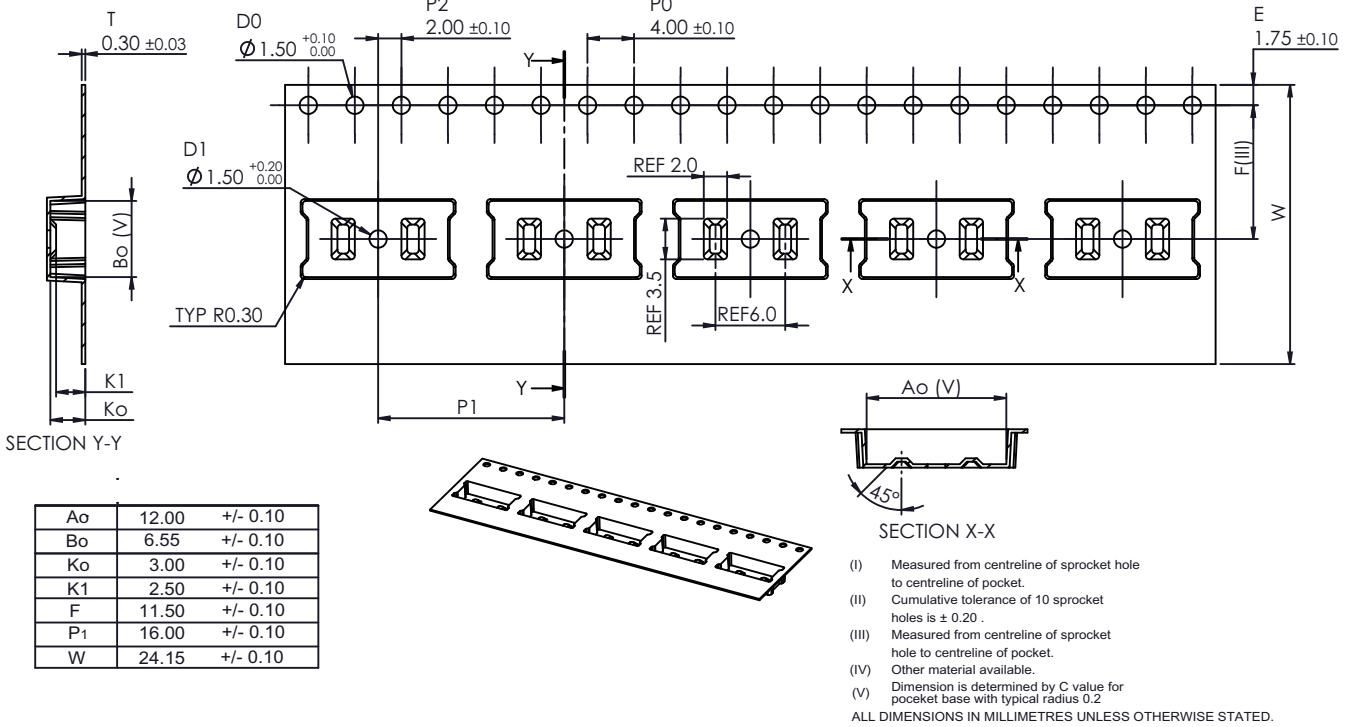


Figure 40. Si8931/32 Typical Package Marking, 8-Pin Narrow Body SOIC

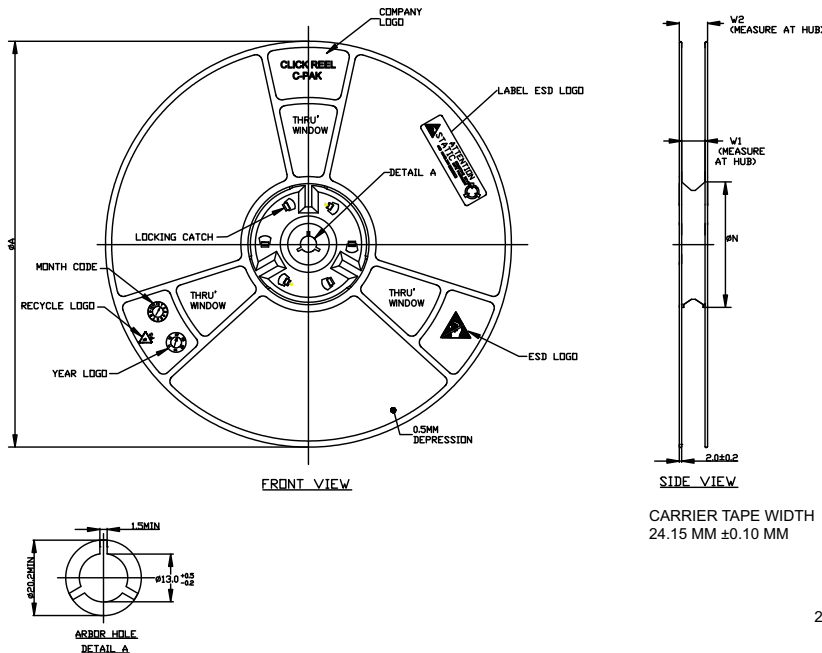
Table 17. 8-Pin Narrow Body SOIC Top Marking Explanation

Line 1	Part Number	Si893x X = Base part number 1 = Differential output 2 = Single-ended output  V = Insulation rating B = 2.5 kV <sub>RMS</sub>
Line 2	CC = Country of origin ISO code abbreviation	
	YY = Year WW = Work Week	Year and work week
Line 3	Circle = 19.7 mils diameter left justified	Manufacturing code



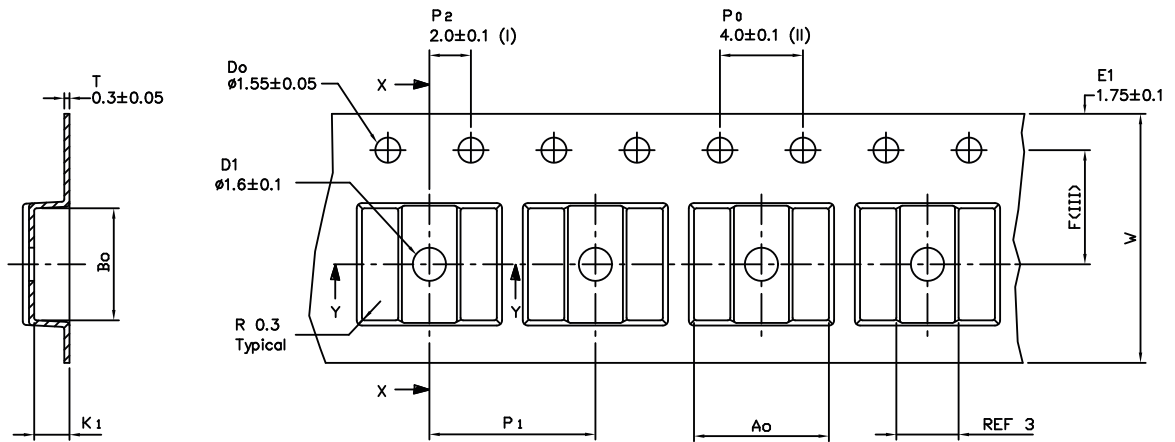
206438-041

Figure 41. Wide Body Carrier Tape Information



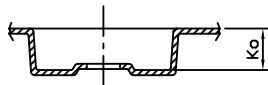
206438-042

Figure 42. Wide Body Reel Information



SECTION X - X

Ao	6.50 +/- 0.1
Bo	5.40 +/- 0.1
Ko	2.00 +/- 0.1
K1	1.70 +/- 0.1
F	5.50 +/- 0.1
P1	8.00 +/- 0.1
W	12.00 +0.3/-0.0



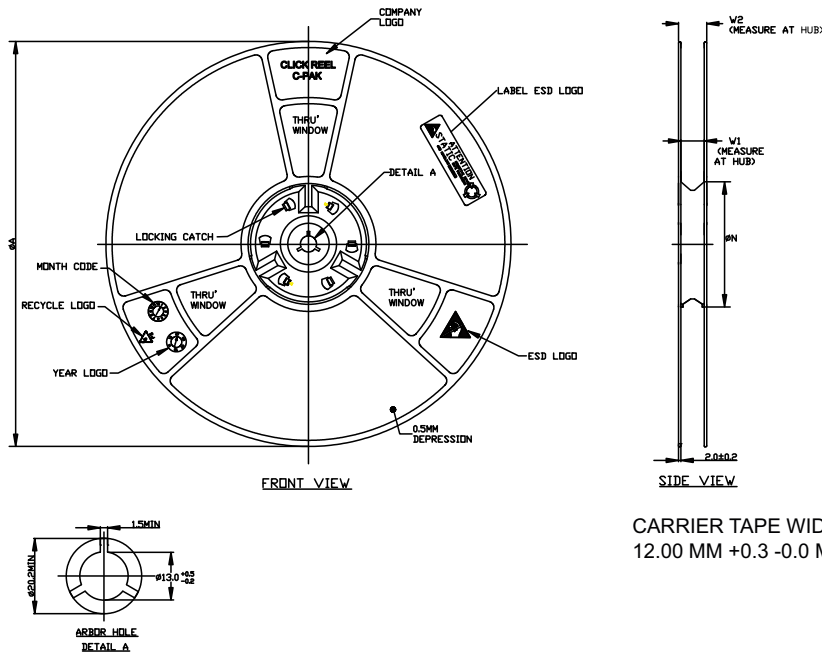
SECTION Y - Y

- (I) Measured from centreline of sprocket hole to centreline of pocket.
- (II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
- (III) Measured from centreline of sprocket hole to centreline of pocket.
- (IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

206438-043

Figure 43. Narrow Body Carrier Tape Information



CARRIER TAPE WIDTH  
12.00 MM +0.3 -0.0 MM

206438-044

Figure 44. Narrow Body Reel Information

## Ordering Information

### Industrial and Automotive Grade Ordering Part Numbers (OPNs)

Industrial-grade devices (part numbers with an “-I” in their suffix) are built using well-controlled, high-quality manufacturing flows to ensure robustness and reliability. Qualifications are compliant with JEDEC, and defect reduction methodologies are used throughout definition, design, evaluation, qualification, and mass production steps.

Automotive-grade devices (part numbers with an “-A” in their suffix) are built using automotive-specific flows at all steps in the manufacturing process to ensure robustness and low defectivity. These devices are supported with AIAG-compliant Production Part Approval Process (PPAP) documentation, and feature International Material Data System (IMDS) and China Automotive Material Data System (CAMDS) listings. Qualifications are compliant with AEC-Q100, and a zero-defect methodology is maintained throughout definition, design, evaluation, qualification, and mass production steps.

Ordering Part Number <sup>1, 2, 3</sup>	Automotive Ordering Part Number <sup>1, 2, 3, 4, 5</sup>	Ordering Options			
		Input Range	Isolation Rating	Output	Package Type
Si8931D-IS4	Si8931D-AS4	0 to 2.5 V nominal	5.0 kV <sub>RMS</sub>	Differential	WB stretched SOIC-8
Si8931B-IS	Si8931B-AS	0 to 2.5 V nominal	2.5 kV <sub>RMS</sub>	Differential	NB SOIC-8
Si8932D-IS4	Si8932D-AS4	0 to 2.5 V nominal	5.0 kV <sub>RMS</sub>	Single-ended	WB stretched SOIC-8
Si8932B-IS	Si8932B-AS	0 to 2.5 V nominal	2.5 kV <sub>RMS</sub>	Single-ended	NB SOIC-8

1. All packages are RoHS-compliant.
2. “Si” and “SI” are used interchangeably.
3. An “R” at the end of the part number denotes tape and reel packaging option.
4. Automotive-grade devices (“-A” suffix) are identical in construction materials, topside marking, and electrical parameters to their Industrial Grade (“-I suffix”) version counterparts. Automotive-Grade products are produced utilizing full automotive process flows and additional statistical process controls throughout the manufacturing flow. The Automotive-Grade part number is included on shipping labels.
5. In the top markings of each device, the Manufacturing Code represented by “TTTTT” contains as its first character a letter in the range N through Z to indicate Automotive Grade.

## Revision History

### Revision C

May, 2023

Updated block diagrams on page 1, Si8932 pin description, and regulatory information.

### Revision B

February, 2023

Re-formatted to new standards. Added new text for Automotive Grade products, AEC-Q100 qualification, added tape and reel information, added MSL ratings. Updated THD specifications.

### Revision 206438A

December, 2022

Updated decimal-based revision number to alphanumeric code.

### Revision 0.9

September, 2022

Updated Safety Approvals on front page.

Updated minimum supply currents in 4. Electrical Specifications.

Updated 4.1 Regulatory Information.

### Revision 0.8

May, 2021

Added Automotive OPNs to Ordering Guide

Updated Figure 3.1 Voltage Sense Application on page 6.

Updated Table 4.4 Absolute Maximum Ratings 1 on page 11.

Added Surge Voltage parameter to Table 4.8 IEC 60747-17 Insulation Characteristics 1 on page 13.

Changed "60 mm" to "60  $\mu$ m" in Solder Mask Design note in Table 6.3 8-Pin Wide Body Stretched SOIC Land Pattern Dimensions on page 25.

### Revision 0.7

December, 2019

Updated Applications and Key Features on front page.

Updated Electrical Specifications after full characterization.

Added section for Automotive Grade OPNs.

Updated Table 4.6 Insulation and Safety-Related Specifications on page 12.

Updated 6.6 Top Marking: 8-Pin Narrow Body SOIC.

Changed Si8932 Pin 6 from NC to GND.

Numerous clarifications throughout.

### Revision 0.5

March, 2019

Updated specifications.

Added narrow body SOIC-8 package.

**Revision 0.2**

May, 2018

Corrections and clarifications.

**Revision 0.1**

January, 2018

Initial draft.

Copyright © 2018-2019, 2021-2023, Skyworks Solutions, Inc. All Rights Reserved.

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products or services. These materials, including the information contained herein, are provided by Skyworks as a service to its customers and may be used for informational purposes only by the customer. Skyworks assumes no responsibility for errors or omissions in these materials or the information contained herein. Skyworks may change its documentation, products, services, specifications or product descriptions at any time, without notice. Skyworks makes no commitment to update the materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

No license, whether express, implied, by estoppel or otherwise, is granted to any intellectual property rights by this document. Skyworks assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Skyworks products, information or materials, except as may be provided in Skyworks' Terms and Conditions of Sale.

THE MATERIALS, PRODUCTS AND INFORMATION ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. SKYWORKS DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Skyworks products are not intended for use in medical, lifesaving or life-sustaining applications, or other equipment in which the failure of the Skyworks products could lead to personal injury, death, physical or environmental damage. Skyworks customers using or selling Skyworks products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

Customers are responsible for their products and applications using Skyworks products, which may deviate from published specifications as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Skyworks assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Skyworks products outside of Skyworks' published specifications or parameters.

Skyworks, the Skyworks symbol, Sky5®, SkyOne®, SkyBlue™, Skyworks Green™, ClockBuilder®, DSPLL®, ISOModem®, ProSLIC®, SiPHY®, and RFelC® are trademarks or registered trademarks of Skyworks Solutions, Inc. or its subsidiaries in the United States and other countries. Third-party brands and names are for identification purposes only and are the property of their respective owners. Additional information, including relevant terms and conditions, posted at [www.skyworksin.com](http://www.skyworksin.com), are incorporated by reference.