

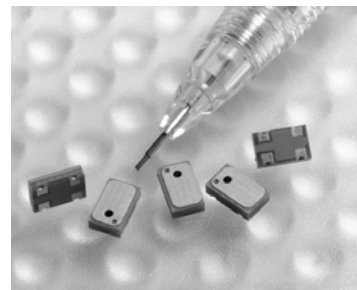
Product Specification: SP0103 Series with Integrated Amplifier

This document applies the following SiSonic Model Numbers:

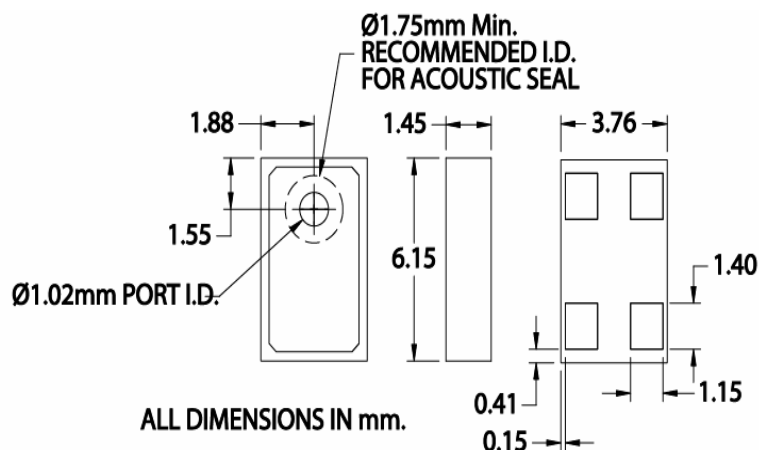
SP0103NC3-2

SP0103NC3-3

SiSonic microphone with integrated amplifier offers designers numerous features: up to 20dB gain, surface-mountable, compatible with standard solder reflow, pick-and-place with standard high speed automated equipment, low output impedance, and excellent environmental characteristics. External amplifiers amplify both signal and external noise induced in the circuit, compared to SiSonic SP0103 that amplifies the signal prior to external noise.

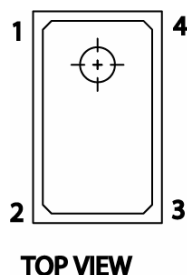


Microphone Dimensional Layout



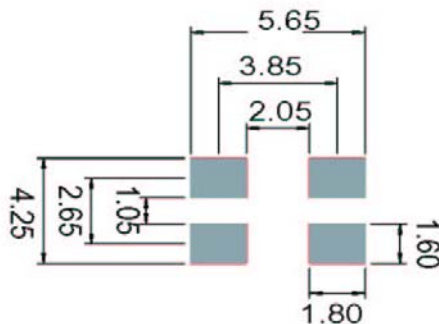
Item	Dim.	Tol. (+/-)	Units
Height	1.45	0.15	mm
Length	6.15	0.05	mm
Width	3.76	0.05	mm
Weight	< 0.5		grams
Coplanarity	< 0.1		mm

Microphone Pin Output



PIN#	FUNCTION
1	OUTPUT
2	GAIN CONTROL
3	GROUND
4	POWER

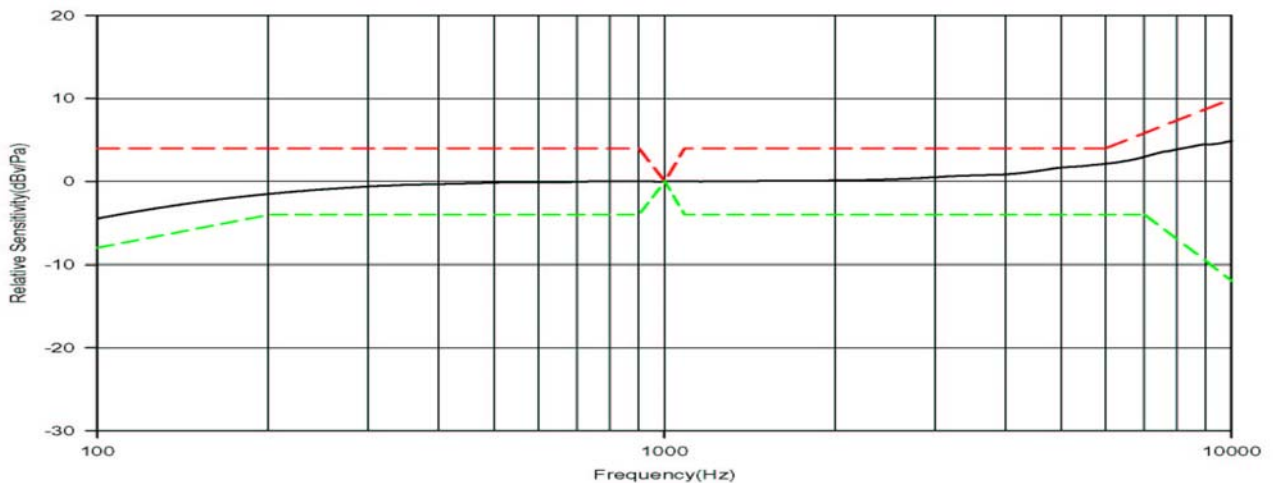
Recommended PCB Land Layout



Product Specifications Test Conditions: +20°C, 60-70% R.H.

	Symbol	Condition	Limits			Unit
			Min.	Nom.	Max.	
Directivity		Omni-directional				
Sensitivity	S	@ 1kHz (0dB=1V/Pa) where R3=0Ω, C1=0.47uF	-26	-22	-18	dB
Output impedance	Z _{OUT}	@ 1kHz (0dB=1V/Pa)			100	Ω
Current Consumption	I _{DSS}	across 1.5 to 5.5 volts	0.100		0.350	mA
Signal to Noise Ratio	S/N	@ 1kHz (0dB=1V/Pa)	55	59		dB
Typical Input Referred Noise	ENL	A-weighted		35		dBA SPL
Supply Voltage	Vs		1.5		5.5	V
Sensitivity Loss across Voltage		Change in sensitivity over 5.5v to 1.5v	No Change Across Voltage Range			dB
Maximum Input Sound Level		At 100dB SPL, THD < 1% At 115dB SPL, THD < 10%				dB
Operating Temperature			-40		+100	°C
Storage Temperature			-40		+100	°C
Frequency Range		100 – 10,000				Hz

Frequency Response Curve



Specifications

Type Detail

The diagram illustrates the cross-section of a bridge deck with various dimensions and reinforcement specifications:

- Overall Dimensions:**
 - Total width: 8.0
 - Width from centerline to edge: 4.0
 - Width from centerline to first reinforcement line: 2.0
 - Deck thickness: 12.0
 - Clearance from top reinforcement to bottom reinforcement: 5.5
 - Distance from centerline to right edge of reinforcement: 1.75
- Reinforcement Details:**
 - Top reinforcement diameter: $\phi 1.5$
 - Bottom reinforcement diameter: $\phi 0.3$
 - Section A-A is indicated at the bottom.
- Labels:**
 - Ao = 4.10
 - Bo = 6.40
 - Ko = 1.75

Tape & Reel	Available in 7" or 13" diameter.
Leader Length	800mm or minimum of 100 empty pockets
Label	Label applied to external package and direct to reel. Per JEDEC.
Storage Life	1 year storage (original packaging, low humidity)
Polarity of part	"L" – direction

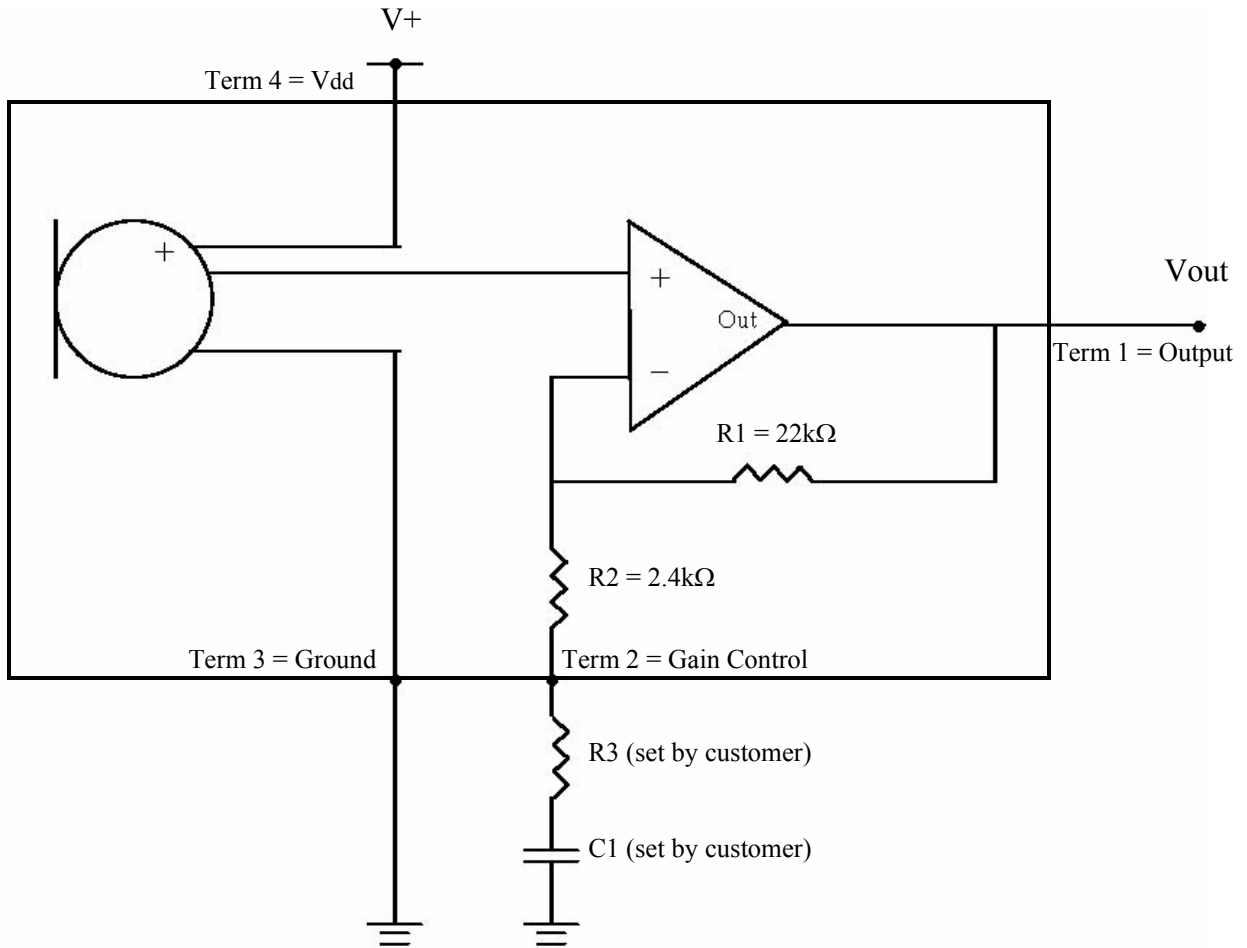
Solder Reflow	260°C for maximum 30 seconds
Terminal Pads	Gold (27u") over Nickel (150u") Typical
# of Reflow Passes	reference Reliability section

The graph illustrates the temperature profile for soldering. The y-axis represents Temperature in degrees Celsius, with markers at 100, 150, 210, and 260. The x-axis represents time in seconds, divided into three phases: Pre-Heat (30-90 sec.), Soldering (10-30 sec.), and Cooling (120 sec.). The temperature rises from 100°C to 150°C during Pre-Heat, remains at 150°C, then rises to 260°C for Soldering, and finally cools down during the Cooling phase.

Reliability

Thermal Shock	Microphone unit must operate when exposed to air-to-air thermal shock 100 cycles, from -40°C to +125°C. (IEC 68-2-4)
High Temperature Storage Test	Microphone unit must maintain sensitivity after storage at +105°C for 1,000 hours. (IEC 68-2-2 Test Ba)
Low Temperature Storage Test	Microphone unit must maintain sensitivity after storage at -40°C for 1,000 hours. (IEC 68-2-1 Test Aa)
High Temperature Operating Test	Microphone unit must operate within sensitivity specifications for 16 hours at 105°C. (IEC 68-2-2 Test Ba)
Low Temperature Operating Test	Microphone unit must operate within sensitivity specifications for 16 hours at -40°C. (IEC 68-2-1 Test Aa)
Humidity Test	Tested under Bias at 85°C/85% R.H. for 270 hours. (JESD22-A101A-B)
Vibration Test	Microphone unit must operate under test condition: 4 cycles, from 20 to 2,000 Hz in each direction (x,y,z), 48 minutes, using peak acceleration of 20g (+20%, -0%). (MIL 883E, method 2007.2, A)
Electrostatic Discharge	Tested to 8kV direct contact discharge or 15kV air discharge as specified by IEC 1000-4-2, level 3 and level 4.
Reflow	Microphone is tested to 5 passes through reflow oven, with microphone mounted upside-down under conditions of 260°C for 30 seconds maximum.
Mechanical Shock	Tested to greater than 5,000g (IEC 68-2-27, Ea).
Note:	After test conditions are performed, the sensitivity of the microphone shall not deviate more than 3dB from its initial value.

Recommended Interface Circuit for SP0103N Integrated Amplifier



Desired Gain	Pin 2 Termination Method
Unity Gain (0dB)	Tie Terminal 2 directly to Output (Terminal 1).
20dB Gain	Tie Terminal 2 through C1 (0.47uF) to Ground.
Adjustable Gain	Add R3 and C1. Use formulas provided to calculate settings, or contact Knowles for support.

Setting Gain Formulas:

Gain of non-inverting Op-Amp is determined as:

$$\Rightarrow G = 1 + \{R1 / (R2 + R3)\} \quad \text{Gain(dB)} = 20 * \log(G)$$

High-pass-filter Corner Frequency:

$$\Rightarrow \text{C.F.} = 1 / \{2 * \pi * (R2 + R3) * C1\}$$