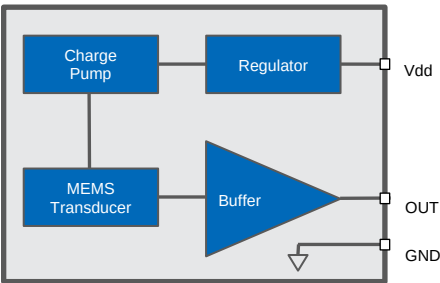
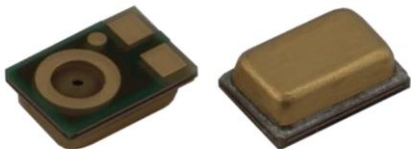


SPV01C8LR5H-1
ANALOG BOTTOM PORT SISONIC™ MICROPHONE

The SPV01C8LR5H-1 is a miniature, high-performance, low power, matched sensitivity bottom port silicon microphone. Using Syntiant’s proven high performance SiSonic™ MEMS technology, the SPV01C8LR5H-1 consists of an acoustic sensor, a low noise input buffer, and an output amplifier. These devices are suitable for applications such as cellphones, smart phones, laptop computers, sensors, digital still cameras, portable music recorders, and other portable electronic devices where excellent wideband audio performance and RF immunity are required



ABSOLUTE MAXIMUM RATINGS

Table 1: Absolute Maximum Ratings

Parameter	Absolute Maximum Rating	Units
Vdd to Ground	-0.5, +5.0	V
OUT to Ground	-0.3, Vdd+0.3	V
Input Current	±5	mA
Storage Temperature	-40 to +120	°C
Operating Temperature	-40 to +105	°C

Stresses exceeding these “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation at these or any other conditions beyond those indicated under “Acoustic & Electrical Specifications” is not implied. Exposure beyond those indicated under “Acoustic & Electrical Specifications” for extended periods may affect device reliability.

PRODUCT FEATURES

- Matched Sensitivity
- LGA Package
- Flat Frequency Response
- Low Current
- RF Shielded
- Bottom Port
- Ultra-Stable Performance
- Omnidirectional
- Standard SMD Reflow

TYPICAL APPLICATIONS

- Headsets
- Portable electronics
- Cellphones
- Laptop Computers
- Tablets
- Portable Music Recorders

ACOUSTIC & ELECTRICAL SPECIFICATIONS¹

Table 2: Normal Mode

Test Conditions: 23 ±2°C, 55±20% R.H., Vdd=2.75V, no load, unless otherwise indicated

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	Vdd		2.5	2.75	3.6	V
Supply Current	Idd	Vdd = 3.6 V	-	190	-	µA
		Vdd = 2.75 V	-	175	-	
Sensitivity	S	94 dB SPL @ 1kHz	-39	-38	-37	dBV/Pa
Signal to Noise Ratio	SNR	94 dB SPL @ 1kHz, A-weighted	-	65	-	dBV/Pa
Near-Ultrasonic SNR		94 dB SPL, @ 19 kHz , BW = 18.5 - 20.0 kHz	-	74	-	dB
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz	-	0.05	-	%
		115 dB SPL @ 1 kHz	-	0.28	-	
		129 dB SPL @ 1KHZ	-	1.5	-	dB SPL
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = typ	-	133	-	dB SPL
Low Frequency Rolloff	LFRO	-3dB relative to 1 kHz	-	85	-	Hz
High Frequency Flatness		+3dB relative to 1 kHz	-	16	-	kHz
Resonant Frequency Peak	Fres		-	33	-	kHz
Power Supply Rejection Ratio	PSRR	200 mVpp sinewave @ 1 kHz, Single-Ended Mode	-	66	-	dB
Power Supply Rejection	PSR+N	200 mVpp 7/8 duty cycle rectangular waveform @ 217 Hz, A-weighted, Single-Ended	-	-90	-	dBV(A)
DC Output		Vdd = 2.75V		1.27	-	V
Output Impedance	Zout	@ 1 kHz	-	440	-	Ω
Output Load	Cload		-	-	100	pF
	Rload	AC-coupled	10	-	-	kΩ
Sensitivity Drop		Vdd(min) ≤ Vdd ≤ Vdd(max)	-	-	0.25	dB
Directivity			Omnidirectional			
Polarity		Increasing sound pressure	Increasing Output Voltage			
Startup Time		S within 1 dB of final value, outputs AC coupled	-	-	10	ms

¹ Sensitivity and Supply Current are 100% tested.

ACOUSTIC & ELECTRICAL SPECIFICATIONS¹

Table 3: Low-Power Mode

Test Conditions: 23 ±2°C, 55±20% R.H., Vdd=1.8V, no load, unless otherwise indicated

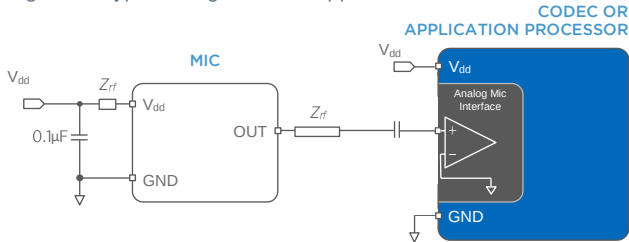
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	Vdd		1.6	1.8	2	V
Supply Current	Idd	Vdd = 1.8V	-	165	-	µA
Sensitivity	S	94 dB SPL @ 1kHz	-39	-38	-37	dBV/Pa
Signal to Noise Ratio	SNR	94 dB SPL @ 1kHz, A-weighted	-	65	-	dBV/Pa
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz	-	0.05	-	%
		115 dB SPL @ 1 kHz	-	0.28	-	
		126 dB SPL @ 1KHZ	-	1.5	-	dB SPL
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = typ	-	128	-	dB SPL
Power Supply Rejection Ratio	PSRR	200 mVpp sinewave @ 1 kHz, Single-Ended Mode	-	83	-	dB
Power Supply Rejection	PSR+N	200 mVpp 7/8 duty cycle rectangular waveform @ 217 Hz, A-weighted, Single-Ended	-	-100	-	dBV(A)
DC Output		Vdd = 1.8V		0.74	-	V
Output Impedance	Zout	@ 1 kHz	-	440	-	Ω
Output Load	Cload		-	-	100	pF
	Rload	AC-coupled	10	-	-	kΩ
Sensitivity Drop		Vdd(min) ≤ Vdd ≤ Vdd(max)	-	-	0.25	dB

¹ Sensitivity and Supply Current are 100% tested.

SPV01C8LR5H-1 ANALOG BOTTOM PORT SISONIC™ MICROPHONE

SYNTIANT®

Figure 1: Typical Single-Ended Application Circuit



NOTES:

If necessary to improve RF performance, optional series components (resistors, ferrites, etc.) should be placed closest to the microphone pads. Bypass capacitors should be placed near each Vdd pin for best performance. Capacitors near the microphone should not contain Class 2 dielectrics due to their piezoelectric effect. Follow the codec manufacturer's recommendations for circuitry and layout.

PERFORMANCE CURVES

Test Conditions: 23 ±2°C, 55±20% R.H., Vdd=1.8V / 2.75V, no load, unless otherwise indicated

Figure 3: Typical Free Field Magnitude Response and Masks

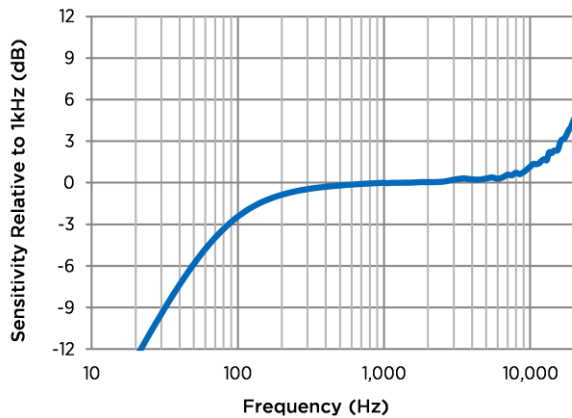


Figure 4: Typical THD vs SPL

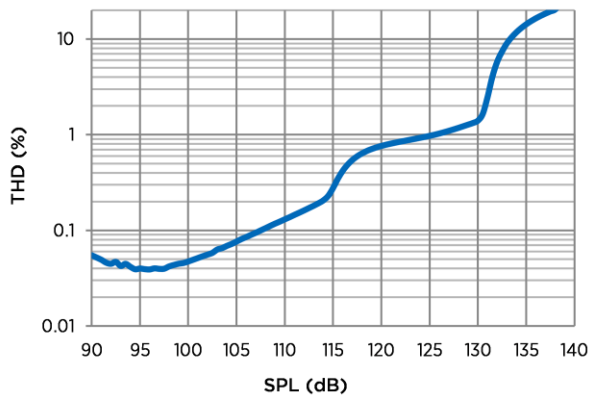


Figure 2 Typical Differential Mode Application Circuit

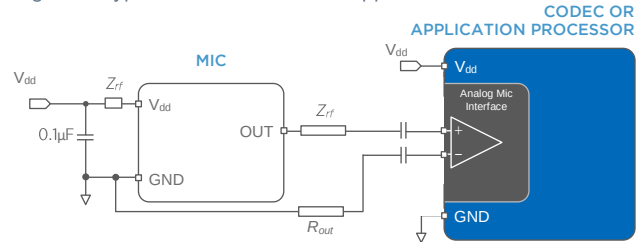


Figure 5: Typical Phase and Group Delay

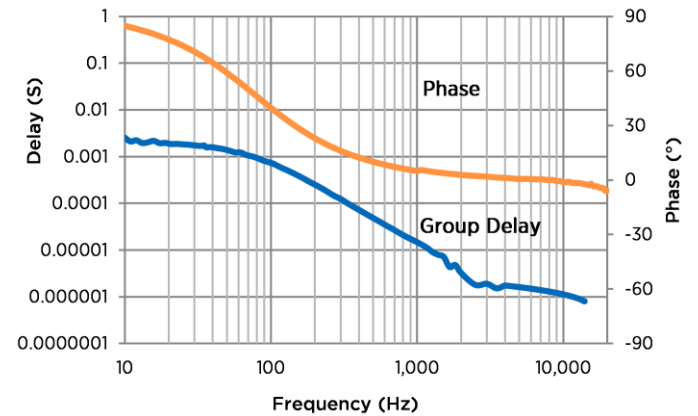


Figure 6: Typical THD vs Frequency

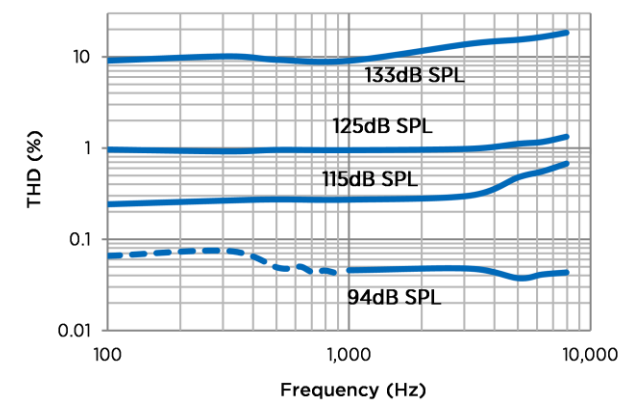


Figure 7: Typical Free Field Ultrasonic Response

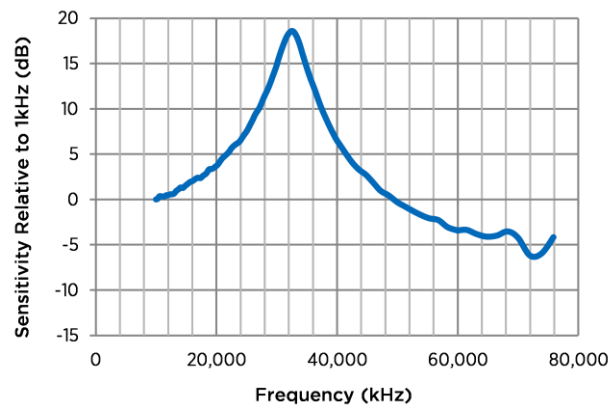


Figure 9: Noise Floor Power Spectral Density

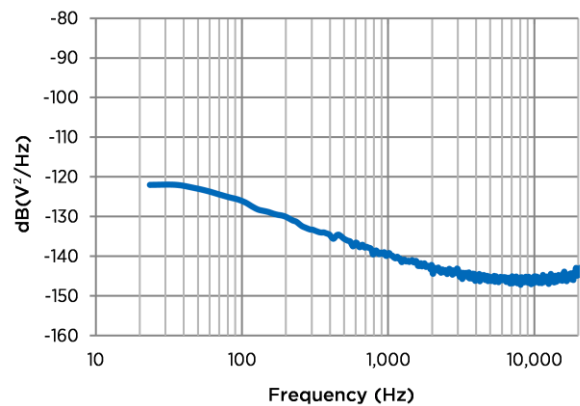


Figure 8: Typical Idd vs Vdd

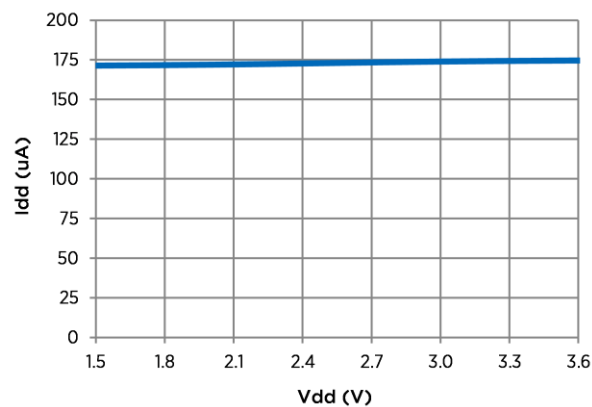
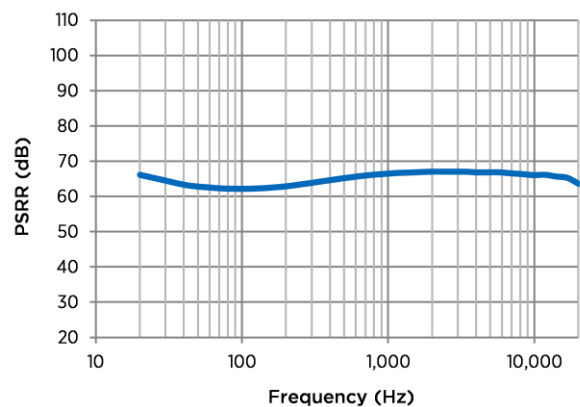


Figure 10: Typical PSRR



Technical drawing of a mechanical part, likely a bracket or plate, showing a top view and a cross-section A-A.

Top View Dimensions:

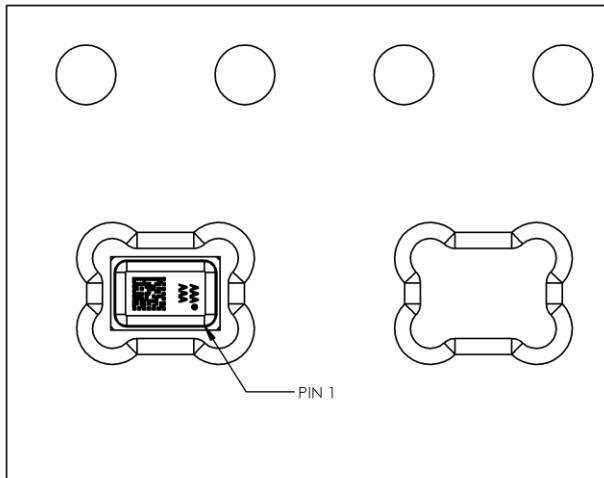
- Overall width: 8.000 ± 0.100
- Distance from left edge to first hole center: 2.00 ± 0.05
- Distance between hole centers: 4.000
- Hole diameter: $\varnothing 1.5^{+0.1}_{0.0}$
- Distance from left edge to first hole center (alternative dimension): 3.04 ± 0.10
- Distance from hole center to right edge: 1.75 ± 0.01
- Distance from hole center to right edge (alternative dimension): 5.50 ± 0.05
- Overall height: $12.0^{+0.3}_{-0.1}$
- Distance from bottom edge to hole center: 2.14 ± 0.10
- Section line A-A is indicated.

Section A-A Dimensions:

- Top fillet radius: $R0.30$
- Top thickness: 0.13 ± 0.10
- Bottom fillet radius: $R0.20 \text{ MAX}$
- Bottom thickness: $1.10^{+0.10}_{-0.05}$

DETAIL B SCALE 4 : 1

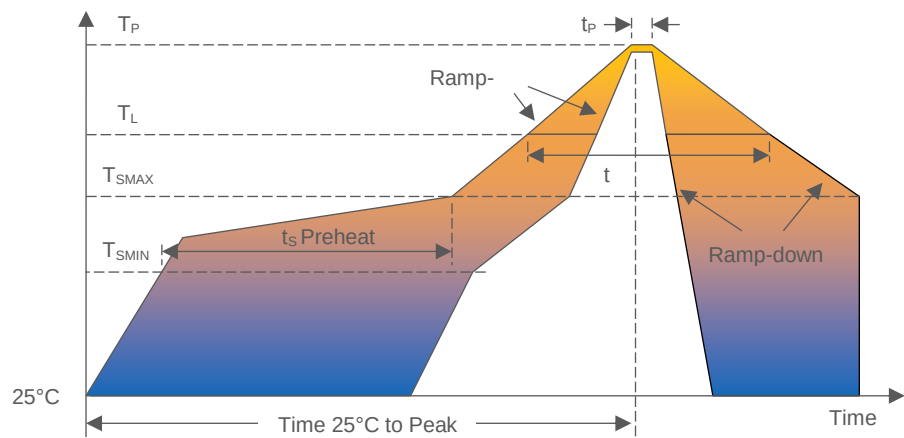
Component	Surface Resistance (ohms)
Reel	$10^5 - 10^9$
Carrier Tape	$10^5 - 10^9$
Cover Tape	$10^4 - 10^{10}$



Letter: "o", orientation mark (pin 1)
 AAAAAA =Internal Code
 2D barcode "ABCDEFGHJKLMNPQRSTUVWXYZ0123456789":
 Unique Job Identification Number for product traceability

Dimensions are in millimeters unless otherwise specified.
Vacuum pickup only in the pick area indicated in Mechanical Specifications.
Tape & reel per EIA-481.
Labels applied directly to reel and external package.
Shelf life: Twelve (12) months when devices are stored in the factory-supplied, unopened ESD moisture sensitive bag under the maximum environmental conditions of 30°C, 70% R.H.

RECOMMENDED REFLOW PROFILE



Profile Feature	Pb-Free
Average Ramp-up rate (T_{SMAX} to T_P)	3°C/second max.
Preheat - Temperature Min (T_{SMIN}) - Temperature Max (T_{SMAX}) - Time (T_{SMIN} to T_{SMAX}) (t_s)	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	217°C 60-150 seconds
Peak Temperature (T_P)	260°C
Time within 5°C of actual Peak Temperature (t_P)	20-40 seconds
Ramp-down rate (T_P to T_{SMAX})	6°C/second max
Time 25°C to Peak Temperature	8 minutes max

NOTES:

Based on IPC/JEDEC J-STD-020 Revision C.

All temperatures refer to topside of the package, measured on the package body surface.

The actual reflow profile used should be optimized based on the reflow requirements of all components, board design, solder paste formulation and reflow equipment used. Details of recommended handling and manufacturing processes can be found in AN25 SMT Manufacturing Guidelines for SiSonic™ Microphones.

ADDITIONAL NOTES

- (A) MSL (moisture sensitivity level) Class 1.
- (B) Maximum of 3 reflow cycles is recommended.
- (C) In order to minimize device damage:
 - Do not board wash or clean after the reflow process.
 - Do not brush board with or without solvents after the reflow process.
 - Do not directly expose to ultrasonic processing, welding, or cleaning.
 - Do not insert any object in port hole of device at any time.
 - Do not apply over 30 psi of air pressure into the port hole.
 - Do not pull a vacuum over port hole of the microphone.
 - Do not apply a vacuum when repacking into sealed bags at a rate faster than 0.5 atm/sec.
 - Do not directly expose to vapor phase soldering.

MATERIALS STATEMENT

Meets the requirements of the European RoHS directive 2011/65/EC as amended.

Meets the requirements of the industry standard IEC 61249-2-21:2003 for halogenated substances and Knowles Green Materials Standards Policy section on Halogen-Free.

Product is Beryllium Free according to limits specified on the Knowles Hazardous Material List (HSL for Products).

Ozone depleting substances are not used in the product or the processes used to make the product, including compounds listed in Annex A, B, and C of the "Montreal Protocol on Substances That Deplete the Ozone Layer."

RELIABILITY SPECIFICATIONS

Test	Description
Thermal Shock	100 cycles of air-air thermal shock from -40°C to +125°C with 15 minute soaks (IEC 68-2-14)
High Temperature Storage	+105°C environment for 1,000 hours (JESD22-A103)
Low Temperature Storage	-40°C environment for 1,000 hours (JESD22-A119)
High Temperature Bias	+105°C environment while under bias for 1,000 hours (JESD22-A108)
Low Temperature Bias	-40°C environment while under bias for 1,000 hours (JESD22-A108)
Temperature/Humidity Bias	+85°C/85% R.H. environment while under bias for 1,000 hours (JESD22-A101A-B)
Vibration	16 minutes in each X, Y, Z axis from 20 to 2,000 Hz with peak acceleration of 20g (MIL STD-883e, Method 2007.2, Condition A)
ESD-HBM	3 discharges at ±2kV direct contact to I/O pins (ANSI/ESDA/JEDEC JS-001-2014)
ESD-HMM	10 discharges at ±8kV direct contact to lid when unit is grounded (ANSI/ESD SP5.6-2009)
ESD-CDM	3 discharges at ±500V (ANSI/ESDA/JEDEC JS-002-2014)
Reflow	5 reflow cycles with peak temperature of +260°C (JEDEC 22-A113F)
Mechanical Shock	3 pulses of 12,000g in each of the X, Y, and Z directions (IEC 68-2-27 Test Ea)

NOTES:

Microphones meet all acoustic and electrical specifications before and after reliability testing, except sensitivity which can deviate up to 3dB.

After 3 reflow cycles, the sensitivity of the microphones shall not deviate more than 1 dB from its initial value.

[illegible]

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Model/Reference Number:
Datasheet SPV01C8LR5H-1 Rev B
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