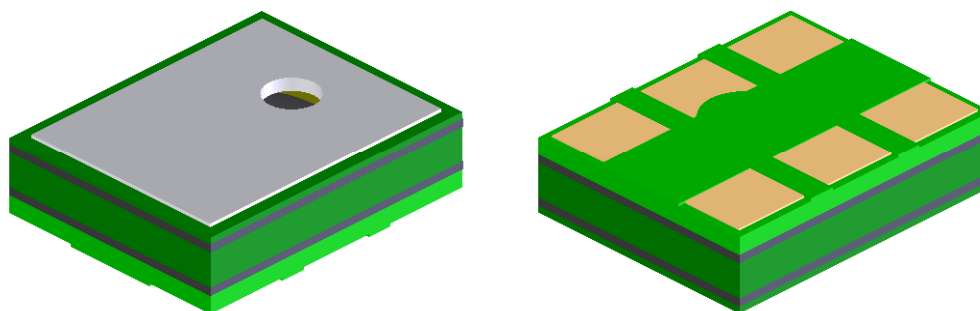


Differential "Mini" Amplified SiSonic™ Microphone
Specification with Enhanced RF Protection - *Halogen Free*



Knowles Acoustics
1151 Maplewood Drive
Itasca, IL 60143

1. DESCRIPTION AND APPLICATION

1.1 DESCRIPTION

Differential "Mini" Amplified Surface Mount Silicon Microphone with Enhanced RF Protection - *Halogen Free*

1.2 APPLICATION

Consumer electronics devices

2. PART MARKING

Identification Number Convention

S	1	2	3
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4	5	6	7
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S: Manufacturing Location

"S" - Knowles Electronics Suzhou
Suzhou, China

"No Alpha Character" - Knowles Electronics
Itasca, IL USA

"E" - Engineering Samples

Digits 1-7: Job Identification Number

3. TEMPERATURE RANGE

3.1 Operating Temperature Range: -40°C to +100°C

3.2 Storage Temperature Range: -40°C to +100°C

4. ACOUSTIC & ELECTRICAL SPECIFICATIONS

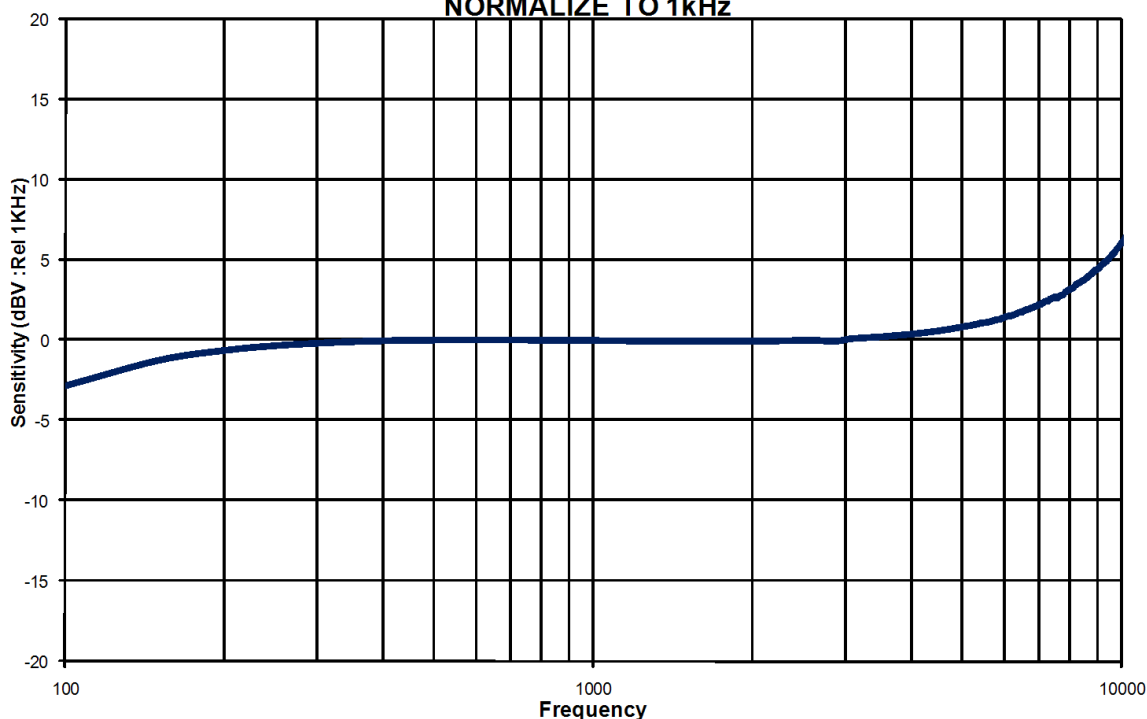
TEST CONDITIONS: +20°C, 60-70% R.H.

	Symbol	Condition	Limits			Unit
			Min.	Nom.	Max.	
Directivity		Omni-directional	---	---	---	
Sensitivity	S	@ 1kHz (0dB-1V/Pa)	-25	-22	-19	dB
Output Impedance	Z _{OUT}	@ 1kHz (0dB-1V/Pa)	---	---	100	Ω
Current Consumption	I _{DDs}	Across 1.5 to 5.5 volts	---	---	500	μA
Signal to Noise Ratio	S/N	@ 1kHz (0dB-1V/Pa)	---	59	---	dB
Supply Voltage	V _s		1.5	---	5.5	V
Typical Input Referred Noise	ENL	A-weighted	---	35	---	dBA SPL
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%				

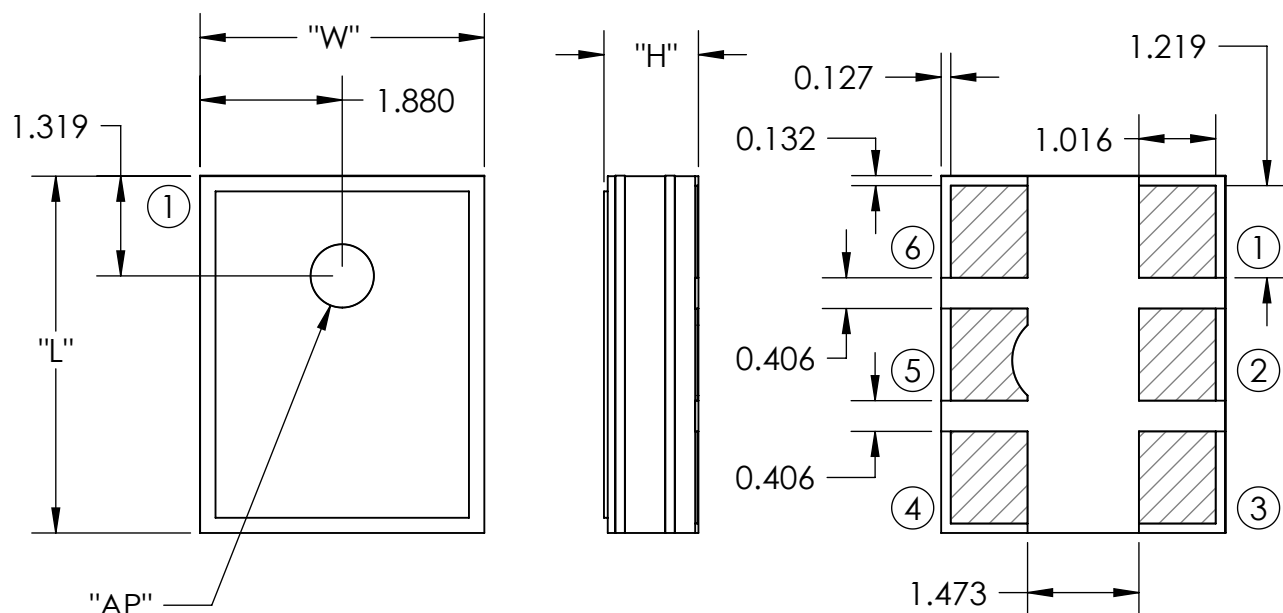
Note: Sensitivity is specified in differential mode at maximum gain. In differential mode with unity gain, sensitivity specification is -36 ± 3 dB. In single ended mode with unity gain, sensitivity specification is -42 ± 3 dB.

5. FREQUENCY RESPONSE CURVE

TYPICAL FREE FIELD RESPONSE
NORMALIZE TO 1kHz



6. MECHANICAL SPECIFICATIONS



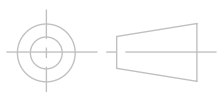
ITEM	DIMENSION	TOLERANCE	UNITS
LENGTH (L)	4.720	±0.100	mm
WIDTH (W)	3.760	±0.100	mm
HEIGHT (H)	1.250	±0.100	mm
ACOUSTIC PORT (AP)	Ø0.838	±0.100	mm

PIN OUTPUT	
PIN #	FUNCTION
1	OUTPUT +
2	OUTPUT -
3	GAIN
4	GROUND
5	NO CONNECT OR GROUND
6	POWER (Vdd)

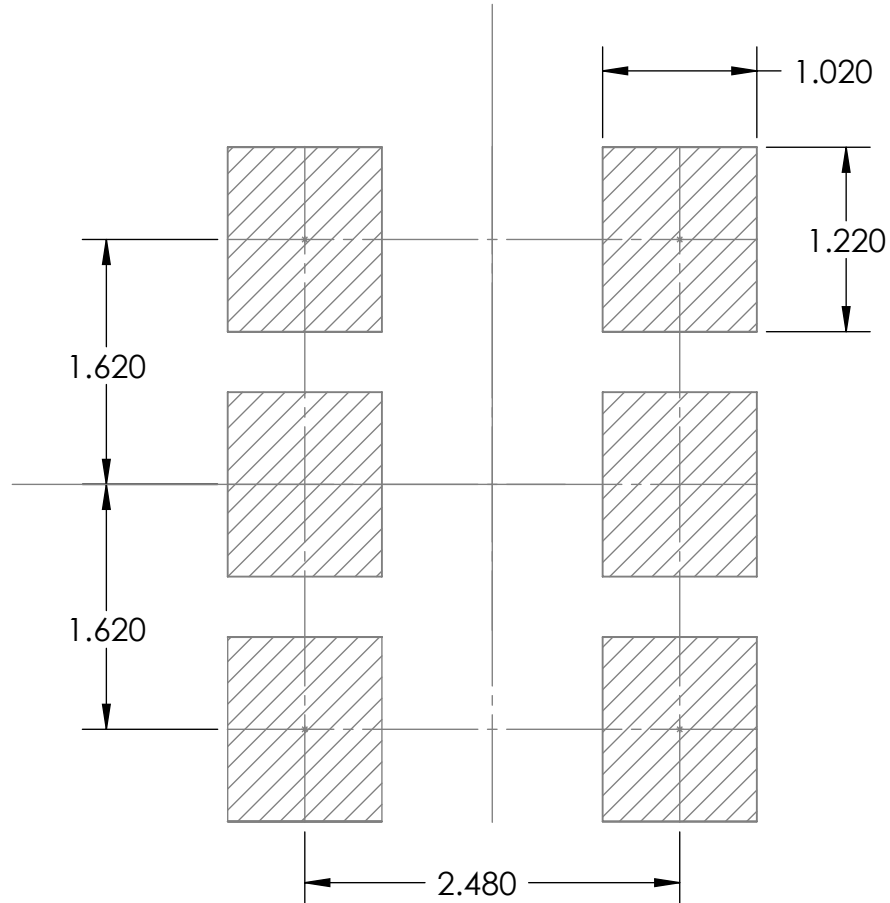
Note:

Dimensions are in millimeters unless otherwise specified.

Tolerance $\pm 0.15\text{mm}$ unless otherwise specified.



7. RECOMMENDED CUSTOMER LAND PATTERN

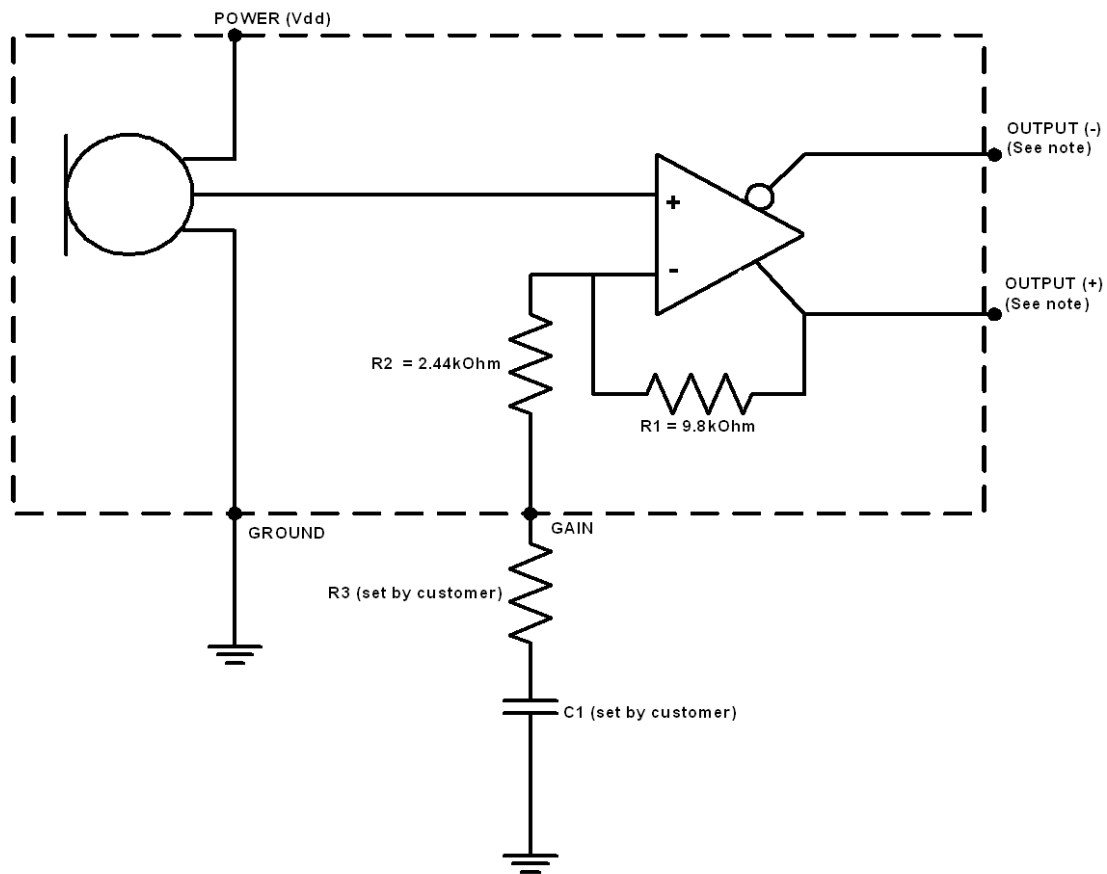


8. RECOMMENDED SOLDER STENCIL PATTERN

N/A

9. RECOMMENDED INTERFACE CIRCUIT

Desired Gain	Gain Pin Termination Method
Unity Gain (0dB)	Tie Gain Pin directly to Output+ Pin.
14dB Gain	Tie Gain Pin through C1 (0.47μF) to Ground Pin.
Adjustable Gain	Add R3 and C1. Use formulas provided to calculate gain and high-pass crossover frequency, or contact Knowles for support.



Note: Customer is recommended to use DC-blocking capacitor to each output line (Output + & Output -) to guard against DC mismatch during start-up.

Setting Gain Formulas:

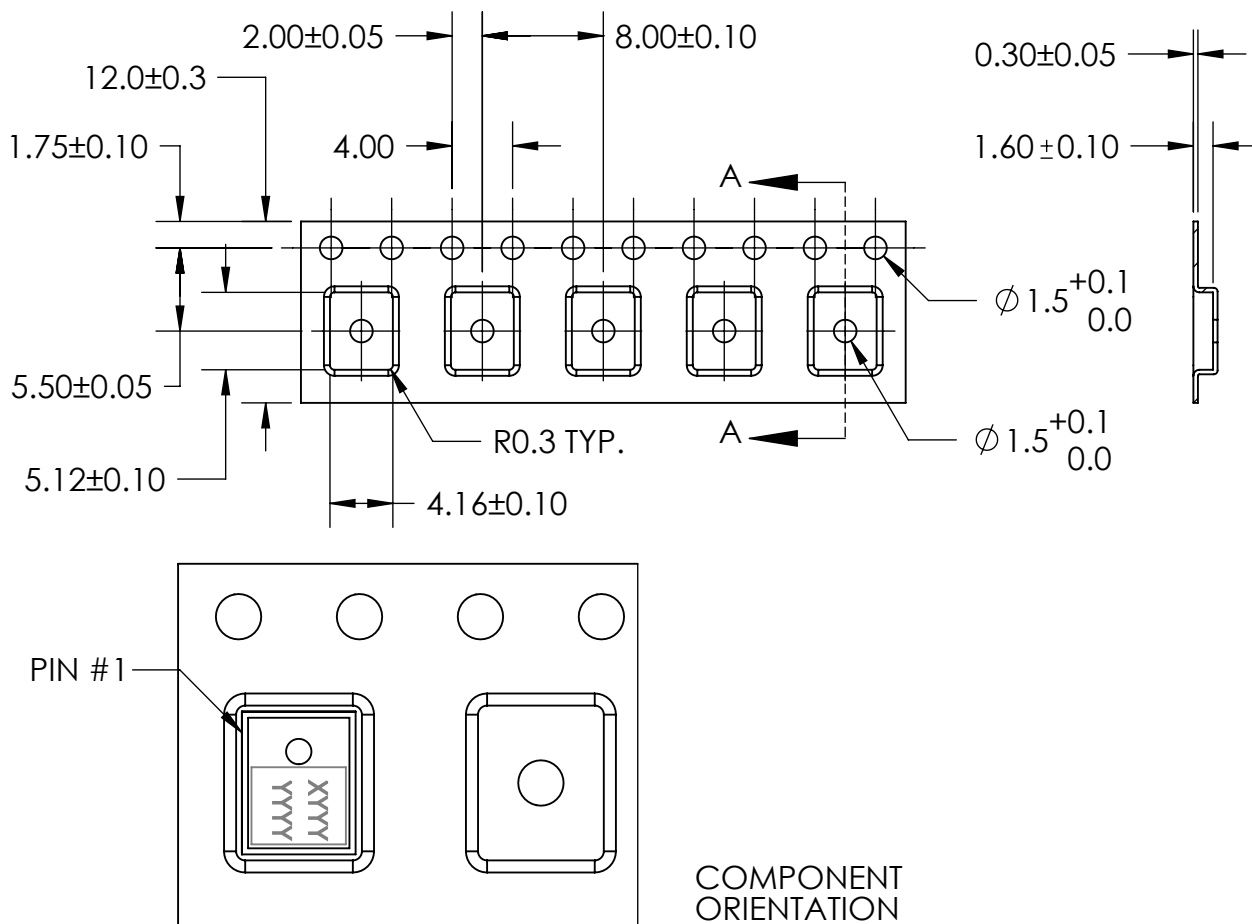
Gain on non-inverting Op-Amp is determined as:

$$\rightarrow G = 1 + \left\{ \frac{R1}{R2 + R3} \right\} \quad \text{Gain(dB)} = 20 * \log(G)$$

High-pass-filter Corner Frequency:

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

10. PACKAGING DETAIL



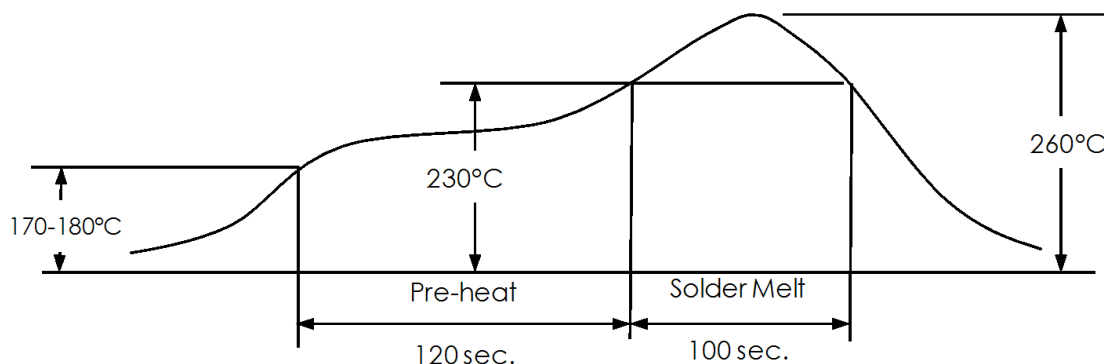
MODEL NUMBER	SUFFIX	REEL DIAMETER	QUANTITY PER REEL
SPM0406HE3H-SB	-2	7"	1,200
	-6	13"	4,800

TAPE & REEL	PER EIA-481
LABEL	LABEL APPLIED TO EXTERNAL PACKAGE & DIRECT TO REEL.

Note:

Dimensions are in millimeters unless otherwise specified.

11. SOLDER FLOW PROFILE



Stage	Temperature Profile	Time (maximum)
Pre-heat	170 ~ 180°C	120 sec.
Solder Melt	Above 230°C	100 sec.
Peak	260°C maximum	30 sec.

12. ADDITIONAL NOTES

- (A) Shelf life: Twelve (12) months when devices are to be stored in factory supplied, unopened ESD moisture sensitive bag under maximum environmental conditions of 30°C, 70% R.H.
- (B) MSL (moisture sensitivity level) Class 2a.
- (C) Do not pull a vacuum over port hole of the microphone. Pulling a vacuum over the port hole can damage the device.
- (D) Do not board wash after the reflow process. Board washing and cleaning agents can damage the device. Do not expose to ultrasonic processing or cleaning.
- (E) Do not brush board after the reflow process. Brushing the board with/without solvents can damage the device.
- (F) Do not insert any object in port hole of device at any time as this can damage the device.
- (G) Number of reflow - Recommend no more than 3 cycles.

13. RELIABILITY SPECIFICATIONS

Note: After test conditions are performed, the sensitivity of the microphone shall not deviate more than 3dB from its initial value.

Test	Description
Thermal Shock	100 cycles of air-air thermal shock from -40°C to +125°C with 15 minute soaks. (ICE 68-2-4)
High Temperature Storage	+105°C environment for 1,000 hours. (ICE 68-2-2 Test Ba)
Low Temperature Storage	-40°C environment for 1,000 hours. (ICE 68-2-2 Test Aa)
High Temperature Bias	+105°C environment while under bias for 1,000 hours. (ICE 68-2-2 Test Ba)
Low Temperature Bias	-40°C environment while under bias for 1,000 hours. (ICE 68-2-2 Test Aa)
Temperature / Humidity Bias	+85°C/85% R.H. environment while under bias for 336 hours. (JESD22-A101A-B)
Vibration	4 cycles lasting 12 minutes from 20 TO 2,000 Hz in X, Y and Z direction with peak acceleration of 20g. (MIL 883E, Method 2007.2, A)
Electrostatic Discharge	3 discharges at +/-8kV direct contact to lid when unit is grounded (IEC 61000-4-2) and 3 discharges at +/-1kV direct contact to I/O pins. (MIL 883E, Method 3015.7)
Reflow	5 reflow cycles with peak temperature of +260°C.
Mechanical Shock	3 pulses of 10,000g in the X, Y and Z direction. (IEC 68-2-27, Test Ea)

[illegible]