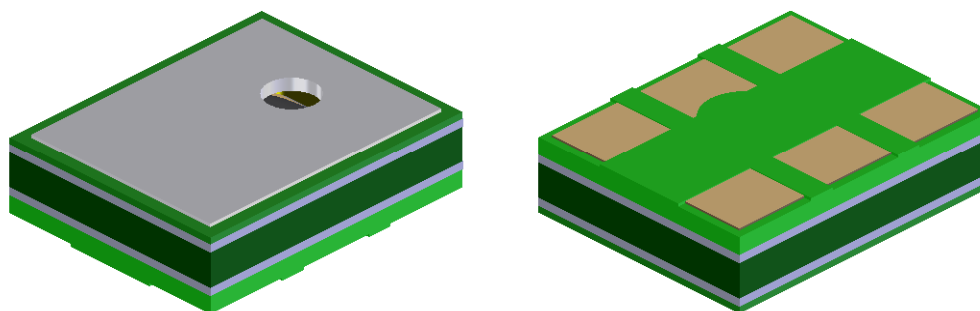


Switchable Gain "Mini" SiSonic™ Microphone Specification  
with Enhanced RF Protection - *Halogen Free*



**Knowles Acoustics**  
1151 Maplewood Drive  
Itasca, IL 60143

## 1. DESCRIPTION AND APPLICATION

### 1.1 DESCRIPTION

Switchable Gain "Mini" 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
---	---	---	---

4	5	6	7
---	---	---	---

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

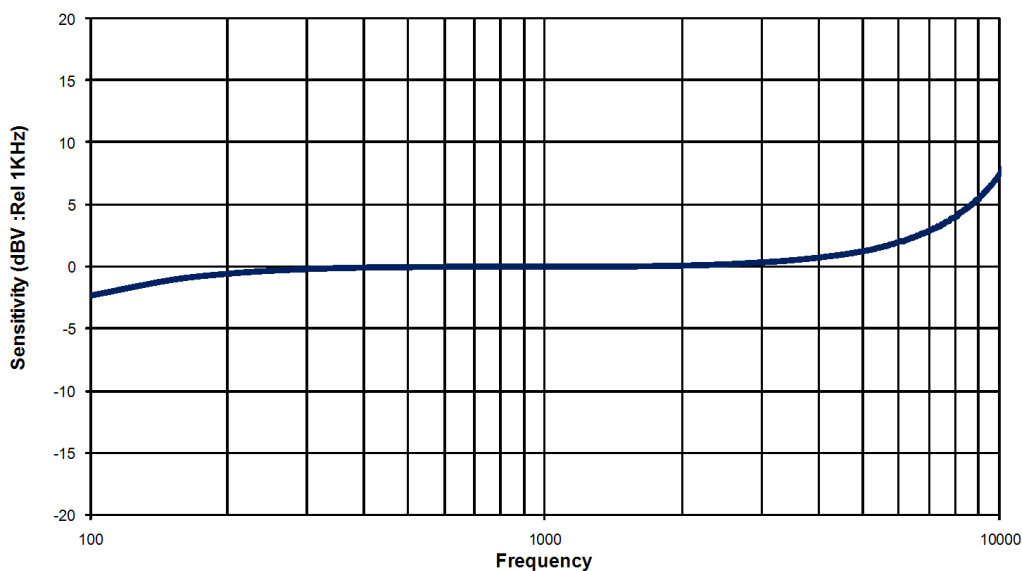
#### 4. ACOUSTIC & ELECTRICAL SPECIFICATIONS

TEST CONDITIONS: +20°C, 60-70% R.H.

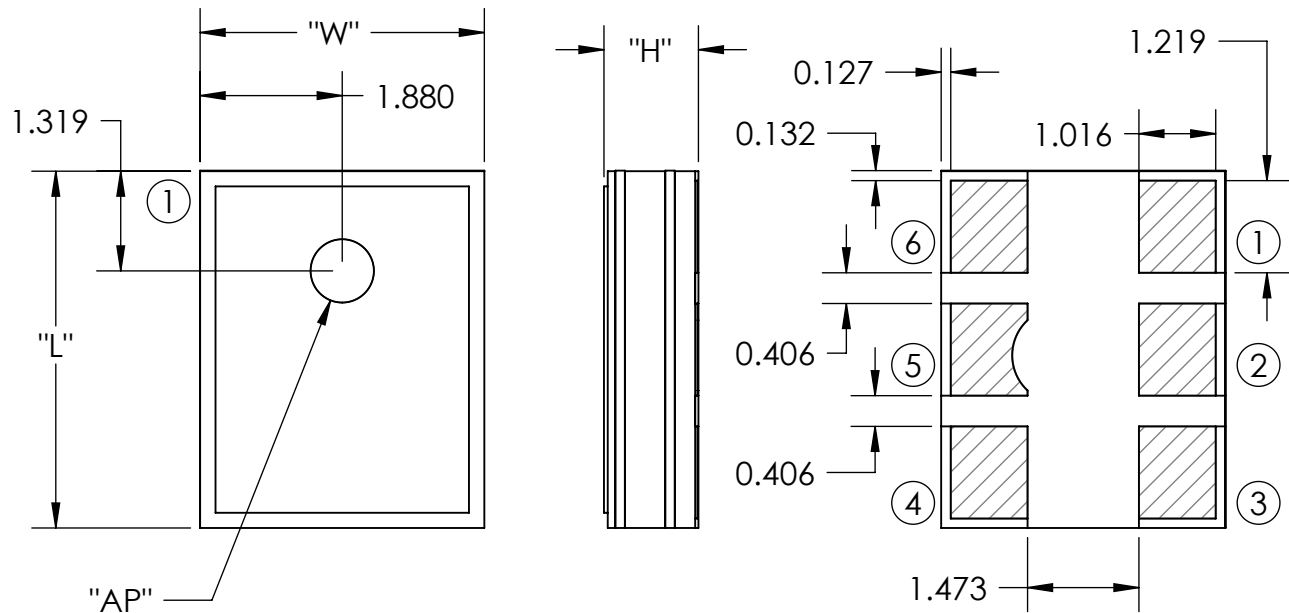
	Symbol	Condition	Limits			Unit
			Min.	Nom.	Max.	
Directivity		Omni-directional	---	---	---	
Nominal Sensitivity Range	S		-42	---	-22	dB
Sensitivity (maximum)	S <sub>max</sub>	@1kHz (0dB=1 V/Pa) Vswitch = High	-25	-22	-19	dB
Sensitivity (maximum)	S <sub>min</sub>	@1kHz (0dB=1 V/Pa) Vswitch = Low	-45	-42	-39	dB
Switching Voltage High	V <sub>switch</sub>	High Gain Switch	1.5	---	5.5	V
Switching Voltage Low	V <sub>switch</sub>	Low Gain Switch	0.0	---	0.4	V
Supply Voltage	V <sub>s</sub>	Operating Voltage	1.5	---	5.5	V
Output Impedance	Z <sub>OUT</sub>	@1kHz (0dB=1 V/Pa)	---	---	100	Ω
Current Consumption	I <sub>DDs</sub>	Across 1.5V to 5.5V	100	---	370	μA
Signal to Noise Ratio	S/N	@ 1kHz (0dB=1V/Pa)	---	59	---	dB
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%				
Frequency Range			100	---	10,000	Hz

#### 5. FREQUENCY RESPONSE CURVE

**TYPICAL FREE FIELD RESPONSE  
NORMALIZED TO 1kHz**



## 6. MECHANICAL SPECIFICATIONS



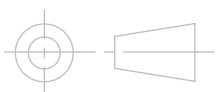
ITEM	DIMENSION	TOLERANCE	UNITS
LENGTH (L)	4.720	±0.100	mm
WIDTH (W)	3.760	±0.100	mm
HEIGHT (H)	1.250	±0.100	mm
ACOUSTIC PORT (AP)	Ø0.838	±0.100	mm

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

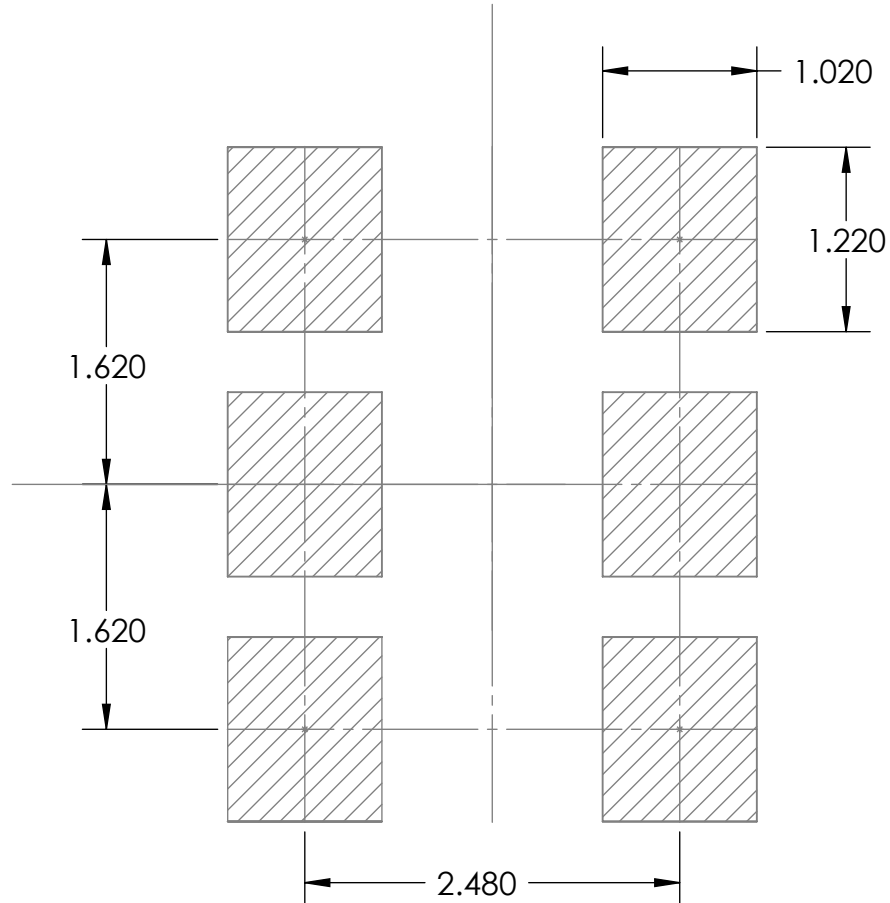
**Note:**

Dimensions are in millimeters unless otherwise specified.

Tolerance ±0.15mm unless otherwise specified.



## 7. RECOMMENDED CUSTOMER LAND PATTERN



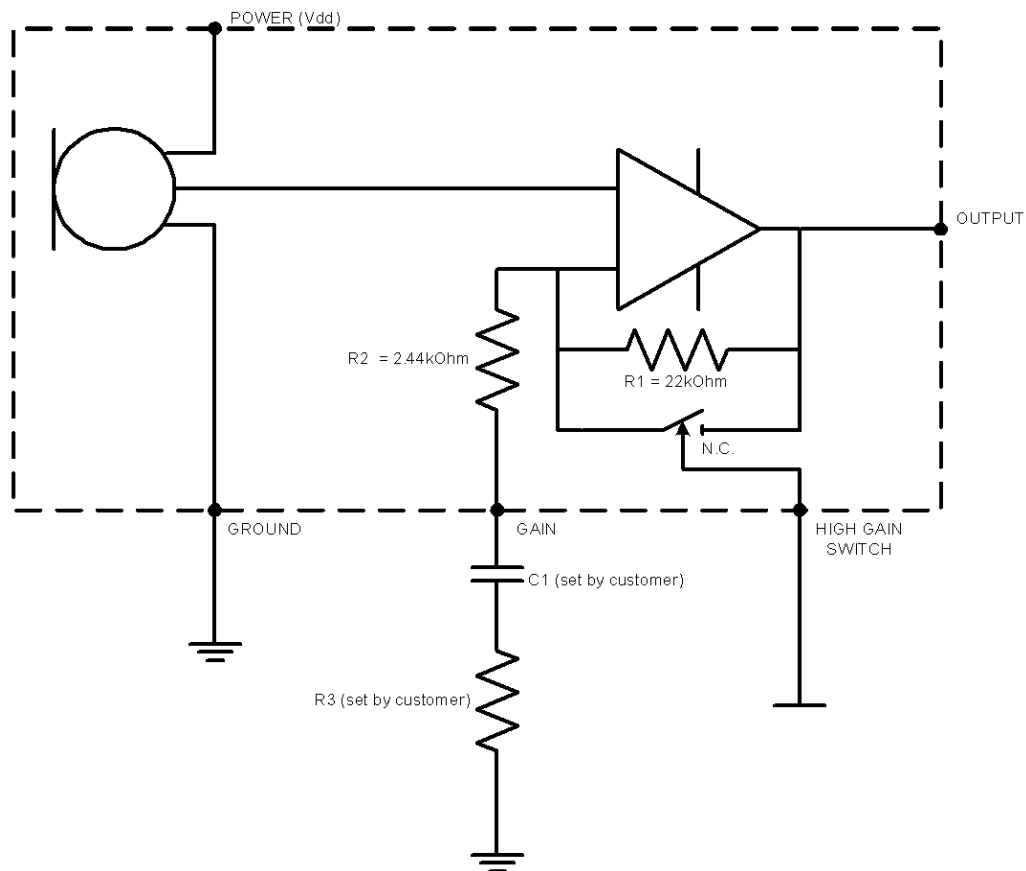
## 8. RECOMMENDED SOLDER STENCIL PATTERN

N/A

## 9. RECOMMENDED INTERFACE CIRCUIT

Gain Setting Guidelines	
Desired Gain (dB)	Method
0dB	$V_{\text{switch}} = \text{Low}$
20dB	$V_{\text{switch}} = \text{High}$ , $C1 > 0.47\mu\text{F}$ *
Customer adjustable gain (between 0 to 20dB)	Add R3 and C1 to achieve specific gain and high-pass crossover frequency.

\* Selection of actual value of C1 depends upon the highpass crossover frequency desired



### Setting Gain Formulas:

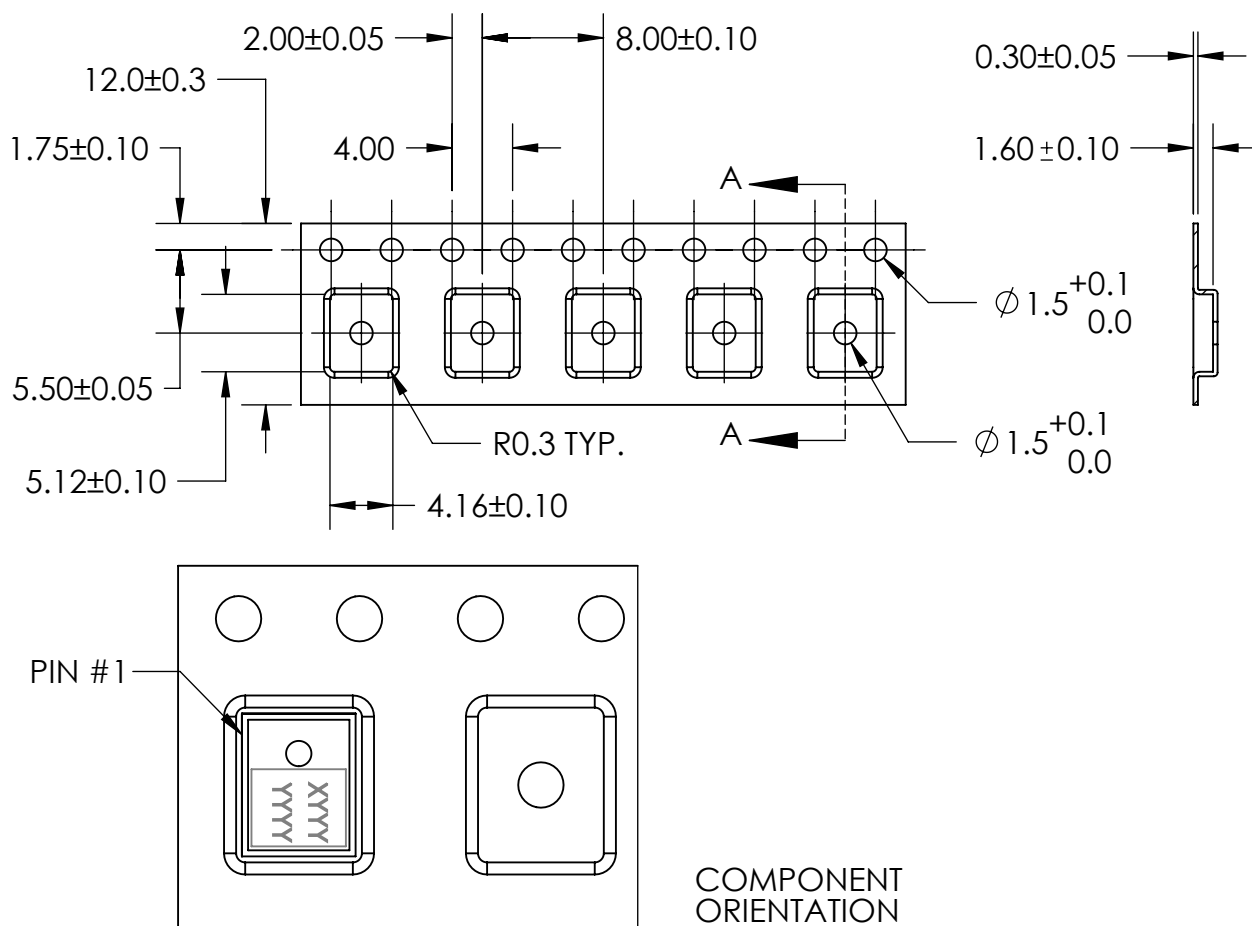
High Gain setting is determined as:

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

High-pass-filter Corner Frequency:

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

## 10. PACKAGING DETAIL



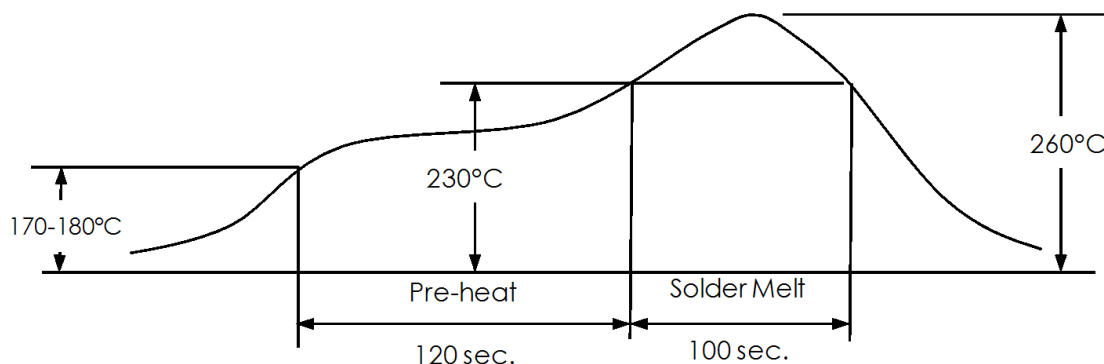
MODEL NUMBER	SUFFIX	REEL DIAMETER	QUANTITY PER REEL
SPM0407HE3H-SB	-2	7"	1,200
	-6	13"	4,800

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)

## 14. SPECIFICATION REVISIONS

Revision	Detailed Specification Changes	Date
<b>A</b>	<b>INITIAL RELEASE</b>	<b>8-28-09</b>

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