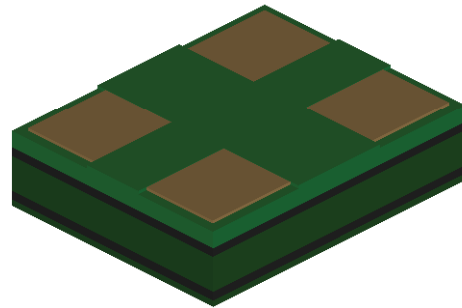
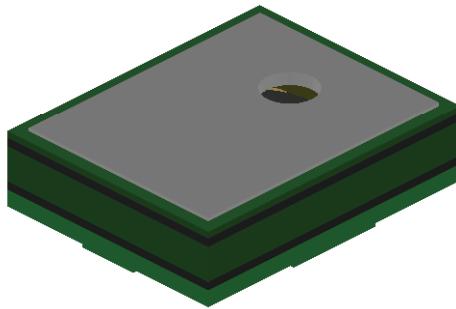


Amplified "Mini" SiSonic™ Microphone  
Specification - *Halogen Free*



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

## **1. DESCRIPTION AND APPLICATION**

### **1.1 DESCRIPTION**

Amplified "Mini" Surface Mount Silicon Microphone.

### **1.2 APPLICATION**

Hand held telecommunication 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

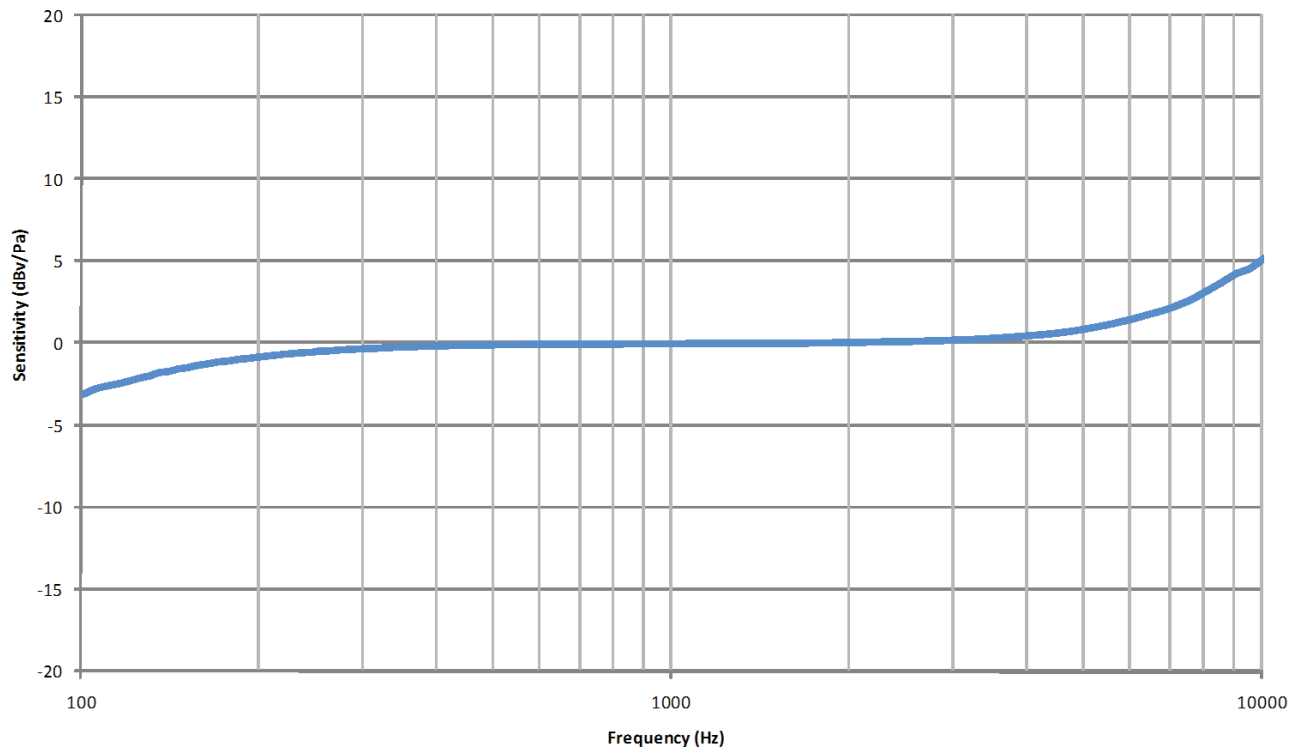
#### 4. ACOUSTIC & ELECTRICAL SPECIFICATIONS

TEST CONDITIONS: +20 °C, 60-70% R.H.

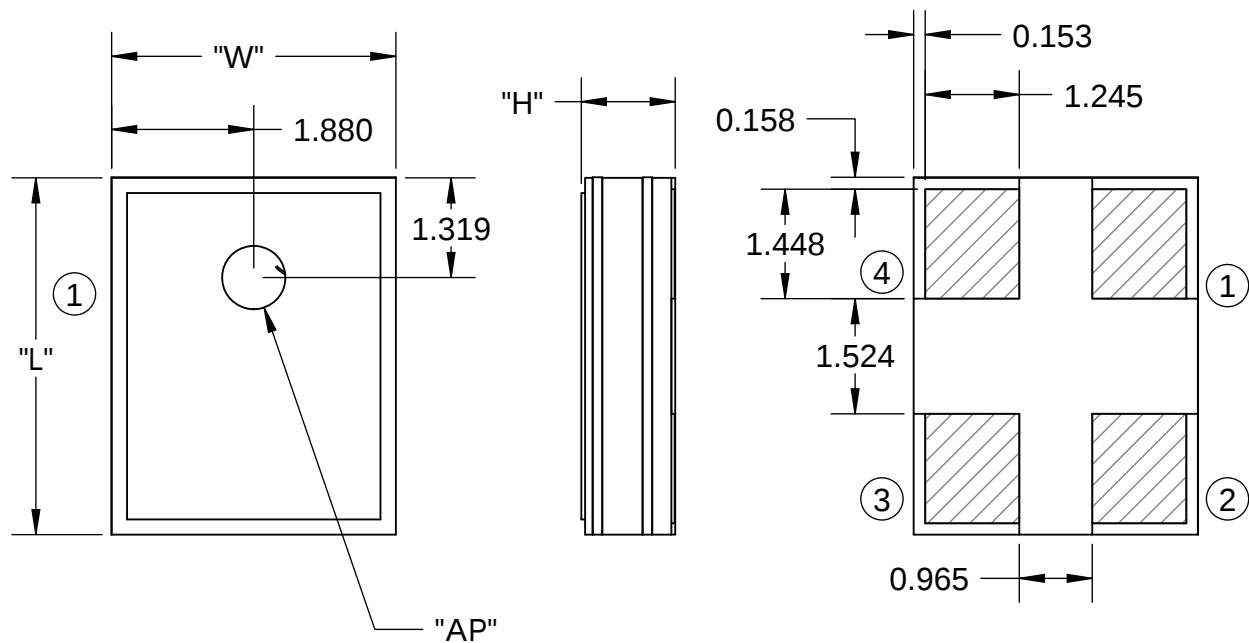
|                                 | Symbol           | Condition                                         | Limits                         |      |      | Unit    |
|---------------------------------|------------------|---------------------------------------------------|--------------------------------|------|------|---------|
|                                 |                  |                                                   | Min.                           | Nom. | Max. |         |
| Directivity                     |                  | Omni-directional                                  | ---                            | ---  | ---  |         |
| Sensitivity                     | S                | @ 1kHz (0dB-1V/Pa)                                | -25                            | -22  | -19  | dB      |
| Output Impedance                | Z <sub>OUT</sub> | @ 1kHz (0dB-1V/Pa)                                | ---                            | ---  | 300  | Ω       |
| Current Consumption             | I <sub>DD</sub>  | Across 1.5 to 3.6 volts                           | 100                            | ---  | 350  | μA      |
| Signal to Noise Ratio           | S/N              | @ 1kHz (0dB-1V/Pa)                                | 55                             | 59   | ---  | dB      |
| Supply Voltage                  | V <sub>s</sub>   |                                                   | 1.5                            | ---  | 3.6  | V       |
| Typical Input Referred Noise    | ENL              | A-weighted                                        | ---                            | 35   | ---  | dBA SPL |
| Sensitivity Loss Across Voltage |                  | Change in sensitivity over 3.6V to 1.5V           | No Change Across Voltage Range |      |      | dB      |
| Maximum Input Sound Level       |                  | At 100dB SPL, THD < 1%<br>At 115dB SPL, THD ≤ 10% |                                |      |      |         |

#### 5. FREQUENCY RESPONSE CURVE

**Typical Free Field Response**  
**NORMALIZED TO 1kHz, C1 = 2.2μF**



## 6. MECHANICAL SPECIFICATIONS



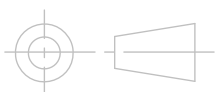
| ITEM               | DIMENSION | TOLERANCE | UNITS |
|--------------------|-----------|-----------|-------|
| LENGTH (L)         | 4.720     | ±0.100    | mm    |
| WIDTH (W)          | 3.760     | ±0.100    | mm    |
| HEIGHT (H)         | 1.250     | ±0.100    | mm    |
| ACOUSTIC PORT (AP) | Ø0.838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

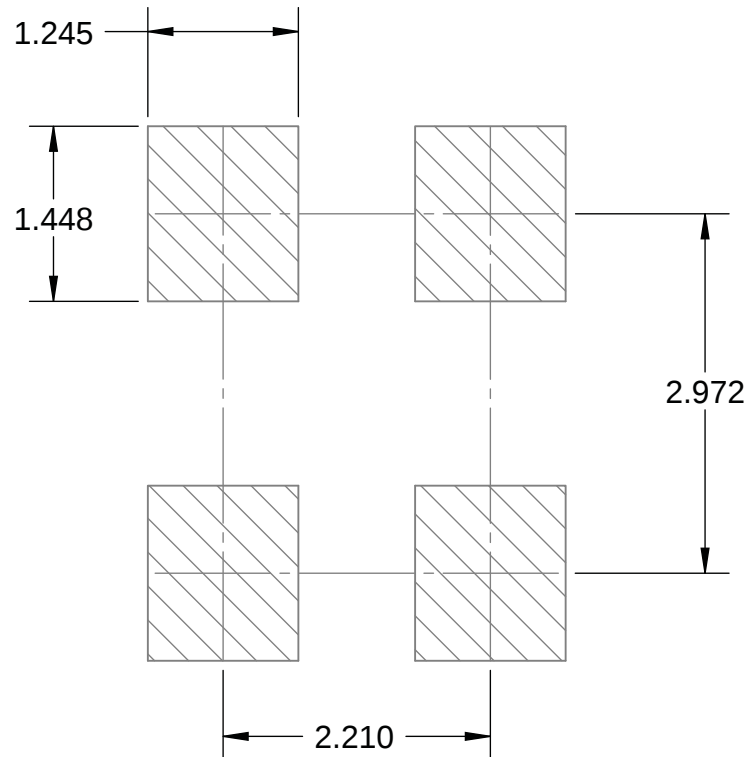
| PIN OUTPUT |             |
|------------|-------------|
| PIN #      | FUNCTION    |
| 1          | OUTPUT      |
| 2          | GAIN        |
| 3          | GROUND      |
| 4          | POWER (Vdd) |

**Note:**

Dimensions are in millimeters unless otherwise specified.

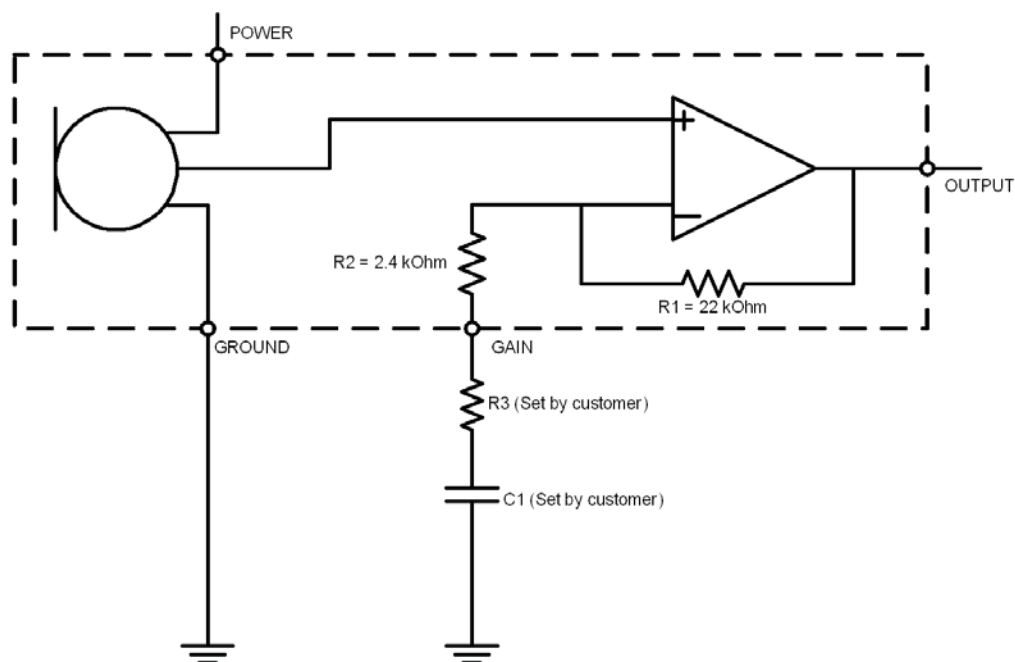
Tolerance ±0.15mm unless otherwise specified.



**7. RECOMMENDED CUSTOMER LAND PATTERN****8. RECOMMENDED SOLDER STENCIL PATTERN**

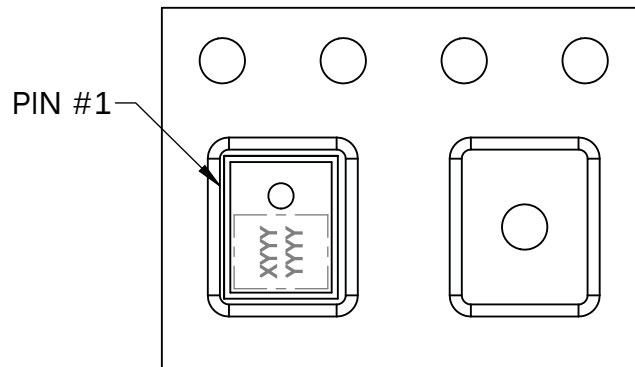
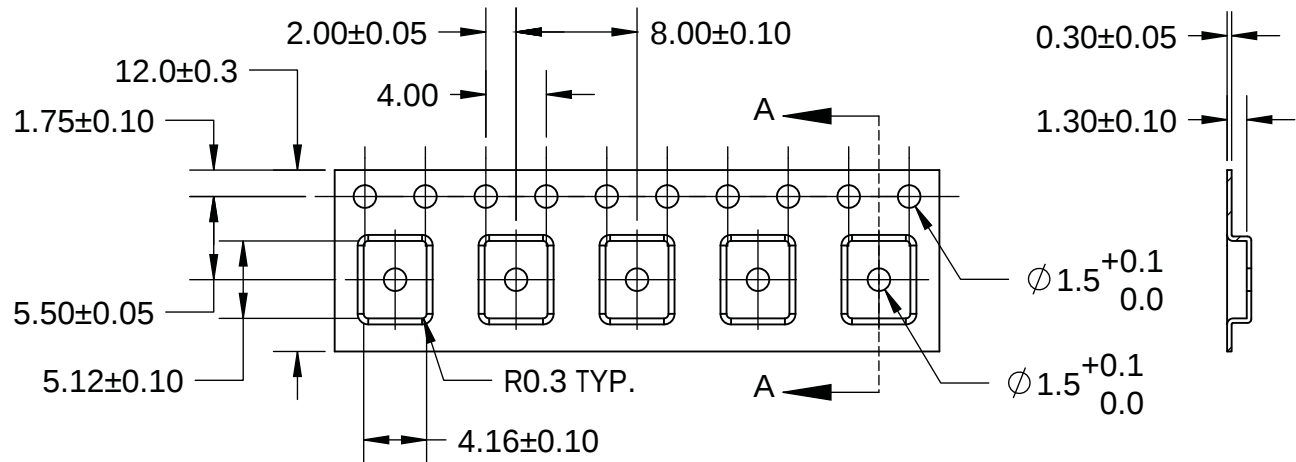
N/A

## 9. RECOMMENDED INTERFACE CIRCUIT



| DESIRED GAIN                                                | GAIN PIN TERMINATION METHOD                                                                        |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Unity Gain (0dB)                                            | Tie Gain Pin directly to Output Pin                                                                |
| 20dB Gain                                                   | Tie Gain Pin through C1 (0.47μF) to Ground                                                         |
| Adjustable Gain                                             | Add Ground Pin and C1. Use formulas provided to calculate settings of contact Knowles for support. |
| Setting Gain Formulas:                                      |                                                                                                    |
| Gain on non-inverting Op-Amp is determined as:              |                                                                                                    |
| -> $G = 1 + \{ R1 / (R2 + R3) \}$ Gain(dB) - $20 * \log(G)$ |                                                                                                    |
| High-pass-filter Corner Frequency:                          |                                                                                                    |
| -> C.F. - $1 / \{ 2 * \pi * (R2 + R3) * C1 \}$              |                                                                                                    |

## 10. PACKAGING DETAIL



COMPONENT  
ORIENTATION

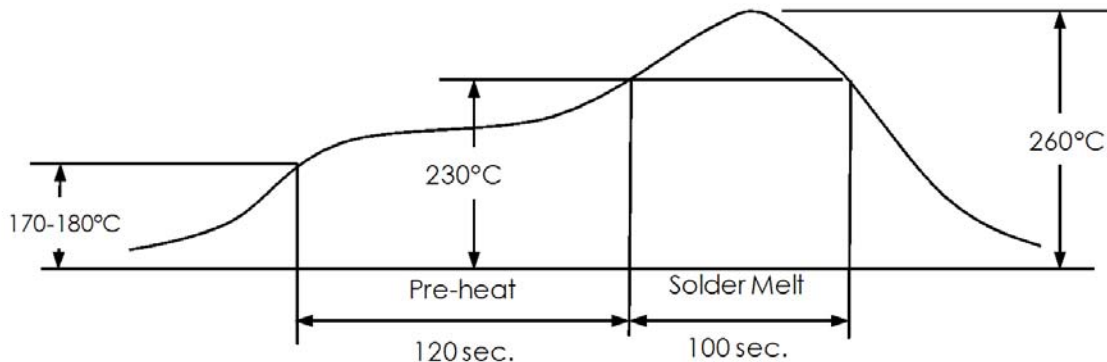
| MODEL NUMBER   | SUFFIX | REEL<br>DIAMETER | QUANTITY<br>PER REEL |
|----------------|--------|------------------|----------------------|
| SPM0404HD5H-SB | -2     | 7"               | 1,200                |
|                | -6     | 13"              | 4,800                |

|             |                                                        |
|-------------|--------------------------------------------------------|
| TAPE & REEL | PER EIA-481                                            |
| LABEL       | LABEL APPLIED TO EXTERNAL PACKAGE &<br>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. MSL (moisture sensitivity level) Class 2a.
- (B) Do not pull a vacuum over port hole of the microphone. Pulling a vacuum over the port hole can damage the device.
- (C) 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.
- (D) Do not brush board after the reflow process. Brushing the board with/without solvents can damage the device.
- (E) Do not insert any object in port hole of device at any time as this can damage the device.
- (F) 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 1,000 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 +/-2kV 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       |
|----------|---------------------------------------------------------------------------------------------------------------|------------|
| A        | Specification Release (MD) (C10110156)                                                                        | 9/11/2009  |
| B        | Corrected pin callouts and Pin Output Table (Sheet 4);<br>Updated Pin #1 location (Sheet 7). (MD) (C10110551) | 11/02/2009 |
| C        | Corrected Pin Output Table (Sheet 4). (MD)<br>(C10110587)                                                     | 12/11/2009 |
|          |                                                                                                               |            |
|          |                                                                                                               |            |
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|          |                                                                                                               |            |

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