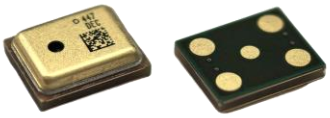
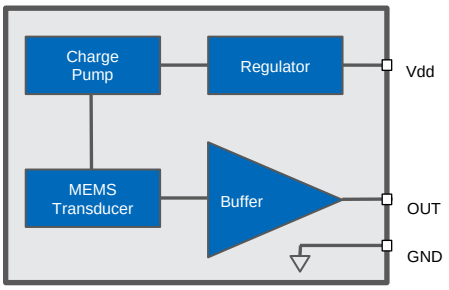
SPU0410HR5H-1
ANALOG TOP PORT SISONIC™ MICROPHONE

The SPU0410HR5H-1 is a miniature, high-performance, low power, matched sensitivity bottom port silicon microphone. Using Syntiant's proven high performance SiSonic™ MEMS technology, the SPU0410HR5H-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





PRODUCT FEATURES

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

TYPICAL APPLICATIONS

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

ABSOLUTE MAXIMUM RATINGS

Table 1: Absolute Maximum Ratings

Parameter	Absolute Maximum Rating	Units
Vdd to Ground	-0.3, +5.0	V
OUT to Ground	-0.3, Vdd+0.3	V
Input Current	±5	mA
Temperature Range	-40 to +100	ºC

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.

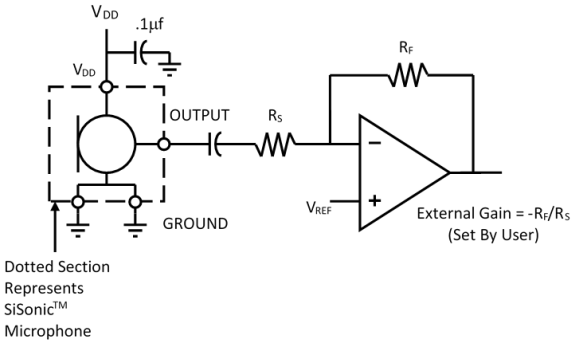
ACOUSTIC & ELECTRICAL SPECIFICATIONS[1]

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	Vdd		1.5	1.8 / 2.75	3.6	V
Supply Current	Idd	Vdd = 3.6 V Vdd = 1.8V / 2.75 V	- -	145 132 / 142	185 185	µA
Sensitivity	S	94 dB SPL @ 1kHz	-43	-42	-41	dBV/Pa
Signal to Noise Ratio	SNR	94 dB SPL @ 1kHz, A-weighted	-	59	-	dBV/Pa
Total Harmonic Distortion	THD	94 dB SPL @ 1kHz	-	.15	.5	%
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = typ	120	125	-	dB SPL
DC Output		Vdd = 1.8V or 2.75V	-	1.3	-	V
Output Impedance	Zout	@ 1 kHz	-	-	400	Ω
Directivity			Omnidirectional			
Polarity		Increasing sound pressure	Decreasing Output Voltage			

[1] Sensitivity and Supply Current are 100% tested.

Figure 1: INTERFACE CIRCUIT



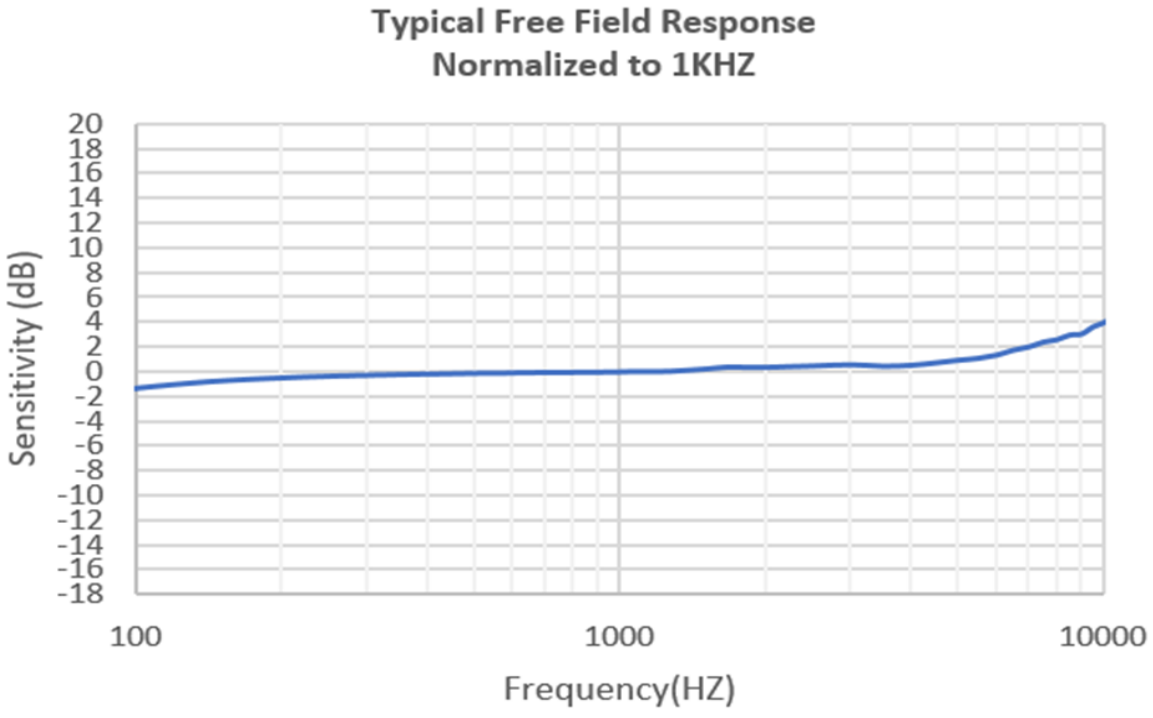
NOTES:

All Ground pins must be connected to ground.
Capacitors near the microphone should not contain Class 2 dielectrics.
Detailed information on acoustic, mechanical, and system integration can be found in the latest SiSonicTM Design Guide application note.

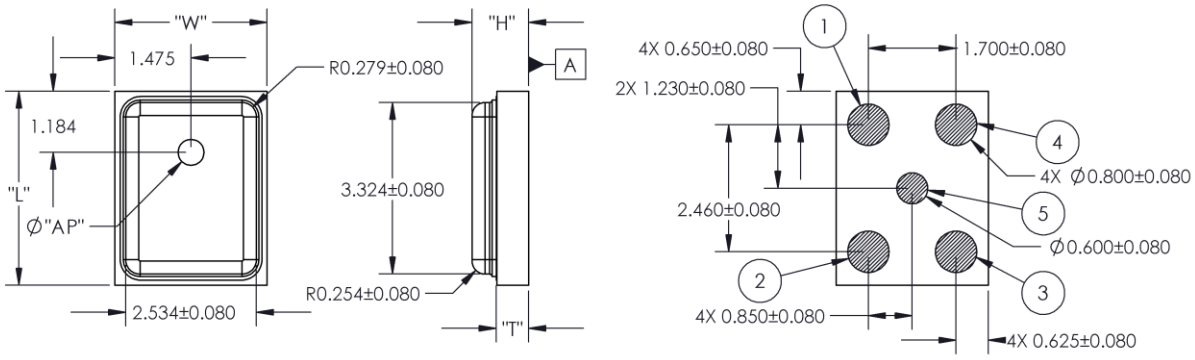
PERFORMANCE CURVES

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

Figure 2: Typical Free Field Magnitude Response



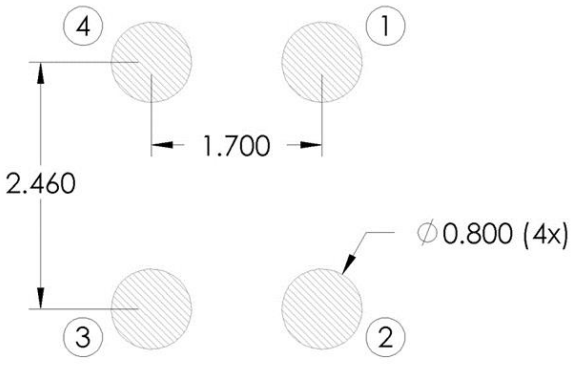
MECHANICAL SPECIFICATIONS



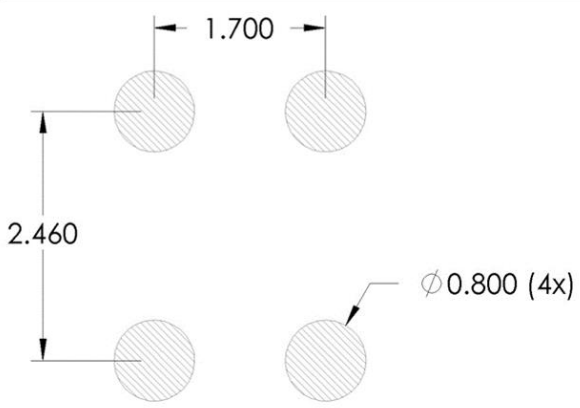
Item	Dimension	Tolerance
Length (L)	3.76	±0.10
Width (W)	2.95	±0.10
Height (H)	1.1	±0.10
Acoustic Port (AP)	Ø0.5	±0.05
PCB Thickness (T)	0.65	±0.05

Pin #	Pin Name	Type	Description
1	Vdd	Power	Power Supply
2	GROUND	Power	Ground
3	GROUND	Power	Ground
4	OUT	Signal	Output
5	Do No Connect	Test	Floating-do not place over ground plane

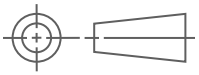
Example Land Pattern



Example Solder Stencil Pattern

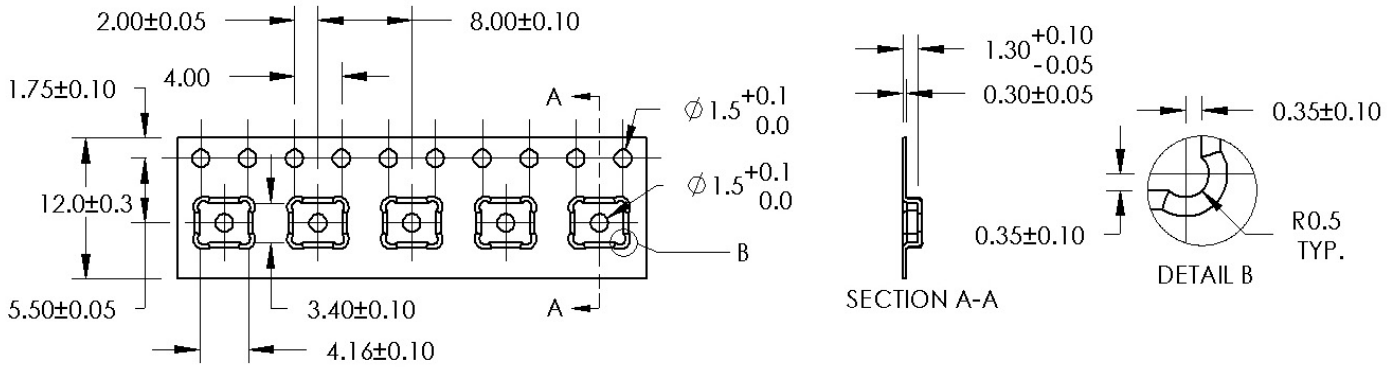


NOTES:



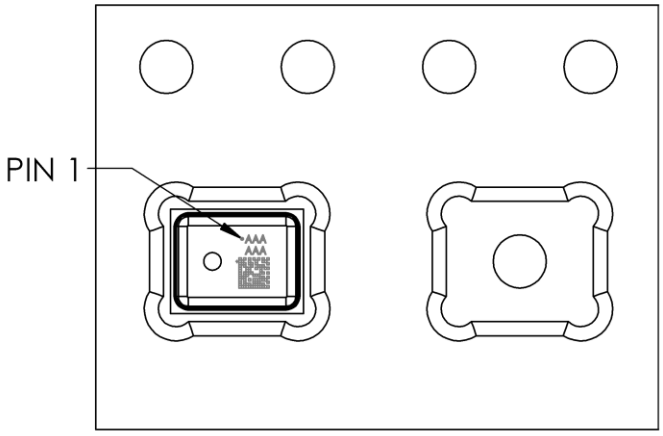
Pick Area only extends to 0.25 mm of any edge or hole unless otherwise specified.
Dimensions are in millimeters unless otherwise specified.
Tolerance is ±0.15mm unless otherwise specified.
In the acoustic path, the recommended PCB Hole Diameter is 0.6 ≤ D ≤ 1.0mm, the recommended Gasket Cavity Diameter is D ≥ 1.0mm and the recommended Case Hole Diameter is 1.0 ≤ D ≤ 1.5mm. Further optimizations based on application should be performed.

PACKAGING & MARKING DETAIL



Model Number	Suffix	Reel Diameter	Quantity Per Reel
SPU0410HR5H-1	-7	13”	5,700

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

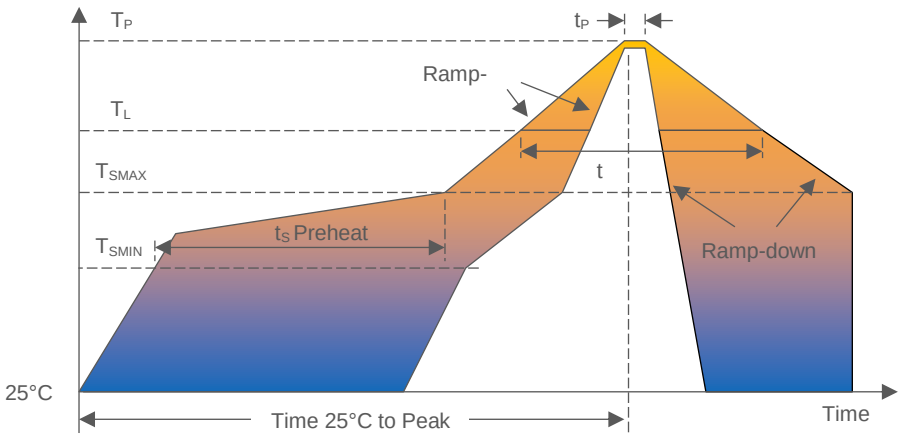


Letter: “o”, orientation mark (pin 1)
AAAAAA = Internal Code
2D barcode "ABCDEFGHJKLMNPQRSTUVWXYZ0123456789":
Unique Job Identification Number for product traceability

NOTES:

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 Syntiant Green Materials Standards Policy section on Halogen-Free.

Product is Beryllium Free according to limits specified on the Syntiant 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.

SPECIFICATION REVISIONS

Revision	Specification Changes	Date
A	Initial Release(ECR-25-6531)	2/12/25

Syntiant Corp.
7555 Irvine Center Drive, Suite 200
Irvine, CA 92618

Phone: +1 949-774-4887
info@syntiant.com
www.syntiant.com

Model/Reference Number:
Datasheet SPU0410HR5H-1 Rev A