

A woman with long dark hair is shown in profile, smiling and wearing white earbuds. She is sitting at a desk with a laptop, a coffee cup, and a small potted plant in the background.

SYNTIANT®

Making Edge AI a Reality™

SYNTIANT SISONIC™ MEMS MICROPHONE
SELECTION GUIDE FOR CONSUMER AUDIO
AND ULTRASONIC APPLICATIONS



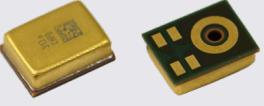
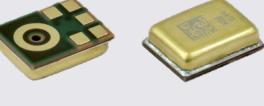
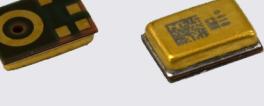
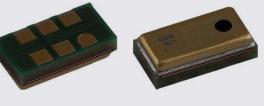
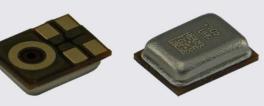
SISONIC™ MEMS MICROPHONES

With over 20 billion units shipped to date, we are the world leader in MEMS microphones across the Mobile, Ear, IoT and Compute markets. Our broad lineup of analog and digital microphones are available in ever-smaller sizes and lower profiles, while our high-SNR MEMS microphones, tuned for lower noise in voice frequency band, pave the way to the latest AI voice applications.

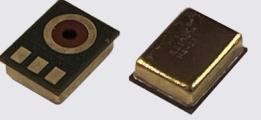
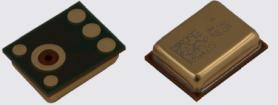
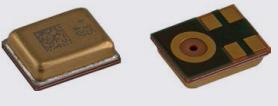
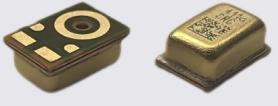
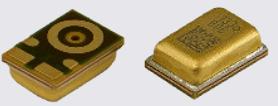
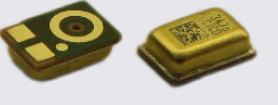
For manufacturers, surface mount designs eliminate off-line subassembly production costs. Our microphones have been used in variety of applications such as mobile phones, remote controls, laptops, smart home products, wireless headsets and more.

Let us help you choose the right microphone for your project!

DIGITAL (PDM) MICROPHONES

	MICROPHONE	DESCRIPTION	SIZE	SNR*	LFRO	1% THD 10% THD*	POWER	
DIGITAL	Hyperion SPK18R1LM4H-1 On flex: KAS-700-0192	High SNR, Low Power, Low Latency for OTE	4.00 × 3.00 × 1.20mm	70.5 dB(A)	20Hz	125 dB SPL 128 dB SPL	360µW @ 768kHz, VDD = 1.8V 810µW @ 2.4MHz, VDD = 1.8V	
	Titan 1.2V SPH88R1LM4H-1 On flex: KAS-700-0185	1.2V _{IO} Compatible, High SNR, Low Latency	3.50 × 2.65 × 0.98mm	68.5 dB(A)	32Hz	125 dB SPL 129.5 dB SPL	305µW @ 768kHz, AVDD = 1.8V, DVDD = 1.2V 675µW @ 2.4MHz, AVDD = 1.8V, DVDD = 1.2V	
	Titan SPH18R1LM4H-1 On flex: KAS-700-0172 *CUSTOMER FAVORITE*	High SNR, Low Power, Low Latency for TWS	3.50 × 2.65 × 1.00mm	68.5 dB(A)	30Hz	123 dB SPL 129 dB SPL	324µW @ 768kHz, VDD = 1.8V 774µW @ 2.4MHz, VDD = 1.8V	
	Gaudi SPG01R8HT4H-1 On flex: KAS-700-0194	Slim Package, Top-Ported	4.00 × 2.00 × 1.10mm	67.5 dB(A)	47Hz	117 dB SPL 120 dB SPL	450µW @ 768kHz VDD = 1.8V 1368µW @ 2.4MHz VDD = 1.8V	
	Maira SPH01R9LM4H-1 On flex: KAS-700-0188 *SAMPLING*	1.2V _{IO} and 1.8V _{IO} Compatible with Single Power Supply	3.50 × 2.65 × 0.80mm	66 dB(A)	32Hz	130 dB SPL 132 dB SPL	432µW @ 768kHz, VDD = 1.8V 1170µW @ 2.4MHz, VDD = 1.8V	
	Helix SPS11R1LM4H-1 On flex: KAS-700-0184	1.2V _{IO} and 1.8V _{IO} Compatible	3.25 × 2.25 × 0.80mm	64.8 dB(A)	33Hz	127 dB SPL 132 dB SPL	305µW @ 768kHz, AVDD = 1.8V, DVDD = 1.2V 665µW @ 2.4MHz, AVDD = 1.8V, DVDD = 1.2V	
	Baracus SPG08P4HM4H-1 On flex: KAS-700-0152	Slim Package, Top-Ported	4.00 × 2.00 × 1.10mm	64 dB(A)	30Hz	117 dB SPL 120 dB SPL	522µW @ 768kHz VDD = 1.8V 1287µW @ 2.4MHz VDD = 1.8V	
	Luiso SPH0141LM4H-1 On flex: KAS-700-0157	Entry Tier Digital	3.50 × 2.65 × 0.98mm	64 dB(A)	45Hz	108 dB SPL 121 dB SPL	423µW @ 768kHz, VDD = 1.8V 1116µW @ 2.4MHz, VDD = 1.8V	

ANALOG MICROPHONES

MICROPHONE	DESCRIPTION	SIZE	SNR*	LFRO	1% THD 10% THD*	POWER	
Raptor SPK01AOLR5H-1 On flex: KAS-700-0175	High SNR, High AOP, Single-ended	4.00 × 3.00 × 1.20mm	72 dB(A)	17Hz	122 dB SPL 130 dB SPL	481µW @ VDD = 2.75V 648µW @ VDD = 3.6V	
Winfrey Pro SPM0192LR5H-1 On flex: KAS-700-0195 *NEW*	High SNR Differential	4.72 × 3.76 × 1.15mm	70.5 dB(A)	13Hz	128 dB SPL 130 dB SPL	619µW @ VDD = 2.75V	
Falcon LFRO = 32Hz: SPH11C3LR5H-1 On flex: KAS-700-0165 LFRO = 18Hz: SPH21C3LR5H-1	Differential 1.8 and 2.7V	3.50 × 2.65 × 1.00mm	68.5 dB(A)	32Hz, 18Hz	125 dB SPL 134 dB SPL	121µW @ VDD = 1.8V 550µW @ VDD = 2.75V	
Astrid SPVA1AOLR5H-1 On flex: KAS-700-0183 *NEW*	Single-ended	2.75 × 1.85 × 1.15mm	68 dB(A)	23Hz	130 dB SPL 132 dB SPL	481µW @ VDD = 2.75V	
Robin SPV61AOLR5H-1 On flex: KAS-700-0170 *CUSTOMER FAVORITE*	Single-ended, Tochi 2 Upgrade	2.75 × 1.85 × 0.90mm	66 dB(A)	35Hz	130 dB SPL 133 dB SPL	481µW @ VDD = 2.75V	
Jamila SPV01C8LR5H-1 On flex: KAS-700-0193	Single-ended, Superior 1% THD Performance	2.75 × 1.85 × 0.90mm	65 dB(A)	85Hz	125 dB SPL 133 dB SPL	481µW @ VDD = 2.75V 684µW @ VDD = 3.6V	
SPU2 TOP SPU01C4HR5H-1 On flex: KAS-700-0196 *NEW*	Analog Top Port	3.76 × 2.95 × 1.10mm	62.5 dB(A)	52Hz	111 dB SPL 125 dB SPL	238µW @ VDD = 1.8V	
Ford 2 SPV0142LR5H-1 On flex: KAS-700-0155	Single-ended	2.75 × 1.85 × 0.90mm	62.5 dB(A)	85Hz	110 dB SPL 124 dB SPL	238µW @ VDD = 1.8V	

*SNR and THD specs apply to normal mode. For low power mode specs, refer to the datasheet.

DIGITAL (PDM) OR ANALOG MICROPHONES?

PDM microphones have an integrated ADC and return oversampled PDM data at the supplied clock frequency. Advantages of PDM microphones include superior noise immunity, simpler PCB layout, typically better system SNR and lower overall power consumption. PDM microphones can greatly simplify system design if the processor or CODEC supports a PDM port.

SIGNAL TO NOISE RATIO

For far field applications like smart speakers, high SNR microphones result in superior audio pickup. ANC and transparency mode features in TWS need high SNR microphones for better user experience. When comparing analog to PDM microphones, reduce the analog SNR by $\sim 1.5\text{dB}$ to account for the external ADC's noise contribution.

ACOUSTIC OVERLOAD POINT (AOP)

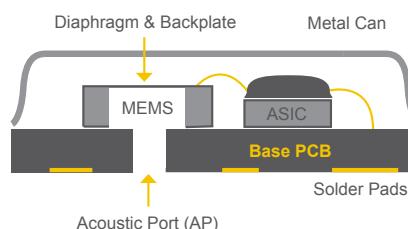
The AOP is the sound pressure level at 1kHz at which the total harmonic distortion is 10%. At this point, audio is heavily clipped and sounds very distorted. Microphones require a high AOP spec if they are subject to high sound levels (eg. close to loudspeakers, in-ear microphones in earbuds, outdoor applications exposed to wind noise).

ULTRASONIC APPLICATIONS

MEMS microphones inherently have a very usable ultrasonic response from 20kHz to 80kHz or more. The output of the u/s signal must be processed by an amp, CODEC, or ADC that can extract the needed frequencies, usually by using a higher sample rate and/or lower decimation rate.

PORT LOCATION

Bottom port microphones typically have better noise performance than an equivalent top port microphone. For this reason, bottom port microphones are preferred unless mechanical constraints dictate a top port microphone.



SENSITIVITY OF PDM MICROPHONES

Sensitivity of microphones is the reference output for 94dB SPL sound. Higher sensitivity implies more signal for a given sound. In PDM microphones, higher sensitivity does not imply higher performance because gain can simply be applied in the digital domain by multiplying the output code. Dynamic range is a better indicator of microphone performance.

LOW FREQUENCY ROLL-OFF (LFRO)

The LFRO is the -3dB point of the frequency response with respect to the sensitivity at 1kHz. A low LFRO is advantageous for bass frequency pickup and ANC, but it is more sensitive to wind noise and low frequency overload in a feedback ANC system.

MEMS VS. ELECTRET CONDENSER (ECM) MICROPHONES

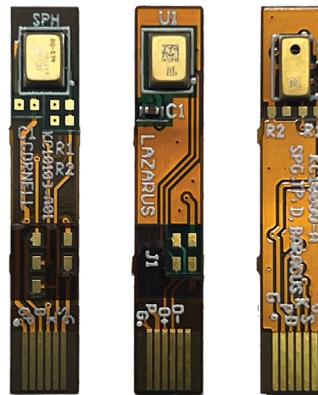
MEMS microphones are reflow capable SMT devices with stable performance under extreme conditions. They are resistant to power supply noise, humidity, and mechanical shock and vibration. Compared to ECMs, MEMS microphones have wide operating temperature and supply voltage ranges where sensitivity does not drift.

EVALUATION KITS

TEST FLEX PCBs

Syntiant utilizes flex PCBs when testing microphones. We have a common size and interface such that flexes from any microphone can be used in various test fixtures. The only difference between the test boards of different microphones is the pinout and pad configuration.

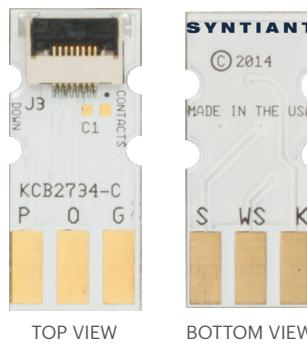
Once microphones are mounted on flex circuits or coupons, it is much easier to access the microphone signals. Testing a larger sample size of devices is facilitated if the flexes and coupons are inserted into an 8 position 0.5mm Kyocera connector (MPN 046288008000846).



Example flex PCBs (Digital bottom port, Analog differential bottom port, Digital top port)

FLEX-TO-COUPON ADAPTER

Syntiant uses an adapter to be able to use flex circuits with a 2x3 Sullins connector (MPN EBM03DSEN-S243) or for convenient connection with flying wires.



ADDITIONAL RESOURCES

Datasheets: www.syntiant.com/mems

Application notes: www.syntiant.com/application-notes

Automotive: www.syntiant.com/automotive-mems

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