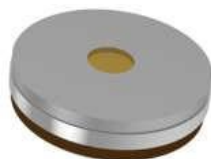
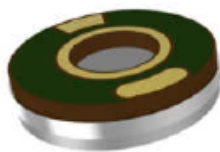


General Description

Ø 5.0 x 1.50 mm MEMS Speaker



Top View



Bottom View



ELECTRICAL SPECIFICATIONS

Parameters	Value	Unit
Resonance Frequency	5000 ±10%	Hz
Q-Factor	1.7	-
Effective membrane surface – S_D	9.1	mm ²
Equivalent volume – V_{AS}	8.0	mm ³
Internal back volume of the speaker	6.0	mm ³

Note: Nominal driving conditions, if not otherwise noted: 1.4 VRMS (2Vp) required.

Electronics

Parameters	Value	Unit
Capacitance (with LCR-Meter at 1V/1kHz)	9.6±2.2	nF
SPL @ 1 kHz / 1mW	106±3	dB
SPL @ 5 kHz / 1mW	101±3	dB

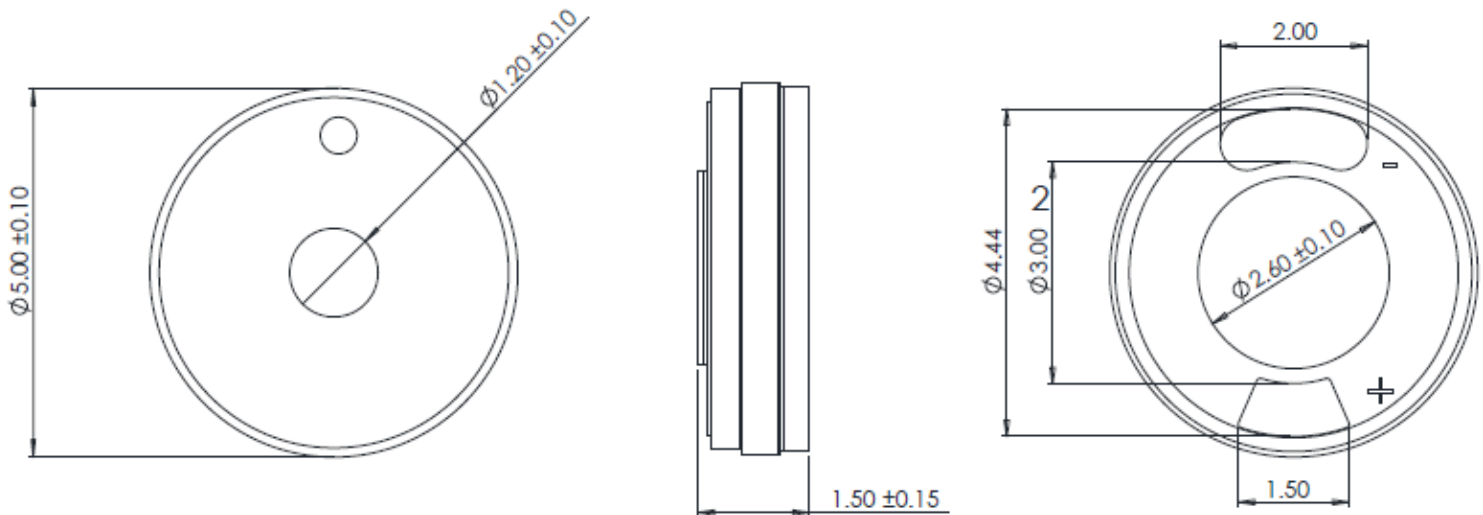
Maximum Operating Conditions

Parameters	Value	Unit
Maximum Voltage Range	-13.5	V
Upper Operating Frequency Limit	80	kHz

ACOUSTICS IN COUPLER (IEC 60318-4)

Parameters	Value	Unit
SPL @ 1 kHz / 1.4 VRMS (2 Vp)	91±3	dB
SPL @ 4 kHz / 1.4 VRMS (2 Vp)	102±3	dB
SPL @ 8 kHz / 1.4 VRMS (2 VP)	102±3	dB
SPL @ 1 kHz / 9.5 VRMS (13.5 Vp)	108±3	dB
SPL @ 4 kHz / 9.5 VRMS (13.5 Vp)	118±3	dB
SPL @ 8 kHz / 9.5 VRMS (13.5 Vp)	118±3	dB
THD @ 1 kHz / 1.4 VRMS (2 Vp)	0.8+0.5	%
THD @ 4 kHz / 1.4 VRMS (2 Vp)	0.7+0.5	%
THD @ 8 kHz / 1.4 VRMS (2 Vp)	0.3+0.3	%

DIMENSIONS

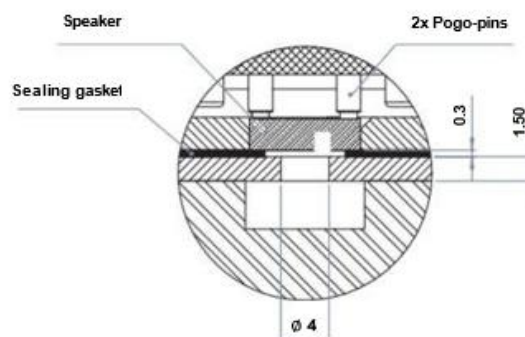
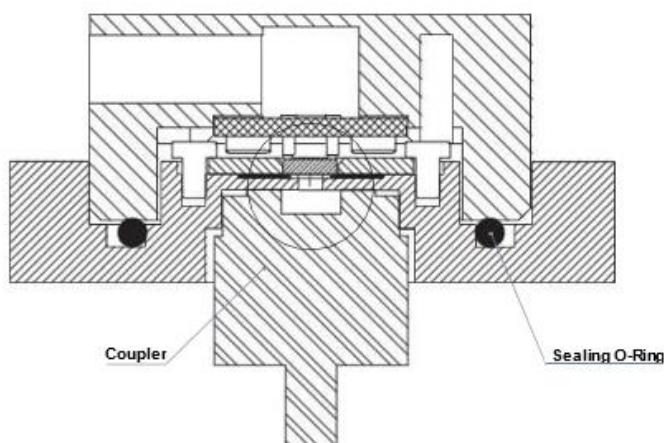


Unit : mm Unmarked Tolerance: ± 0.1 (mm)

MEASUREMENT SYSTEM SETUP

General	
Measurement system	Audio Precision APx
Measurement signal	Exp. Sweep
Voltage level VAC	1.4 Vrms (2 Vp) // 9.5 Vrms (13.5 Vp)
Applied back volume	Open (infinite)

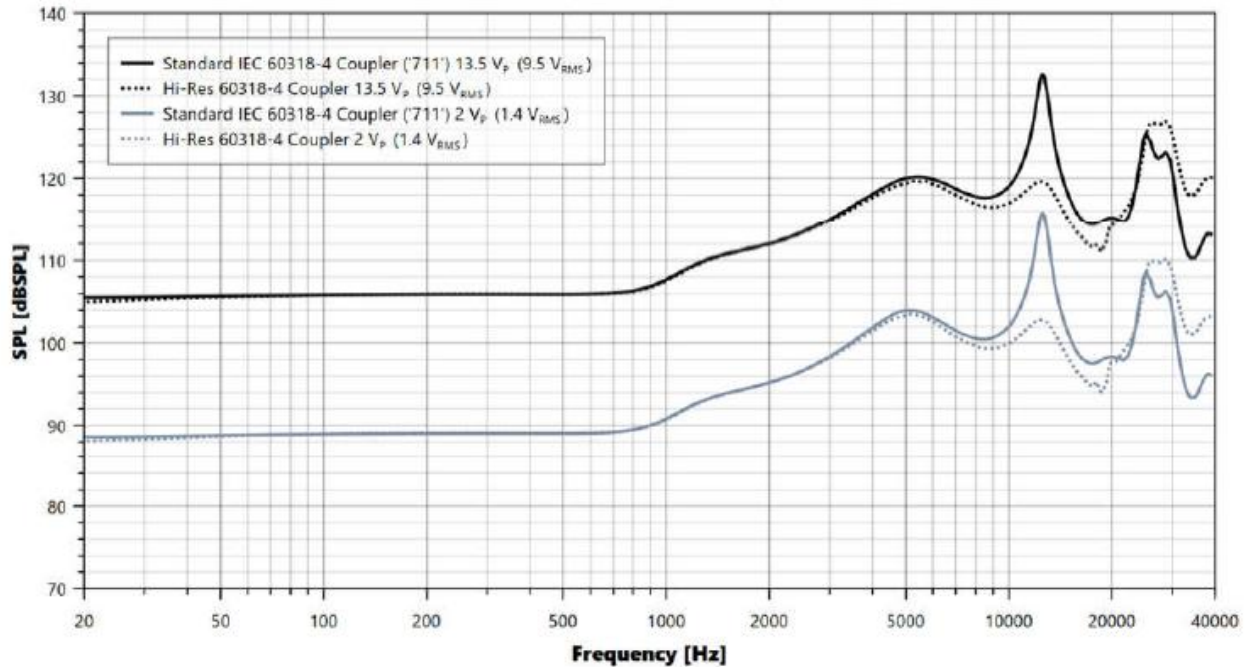
Coupler (IEC 60318-4)	
Coupler type	IEC 60318-4 ('711')
Coupler volume	1.26 cm ³
Connection tube length	1.5 mm
Connection tube diameter	3.0 mm
Microphone	GRAS 43AC



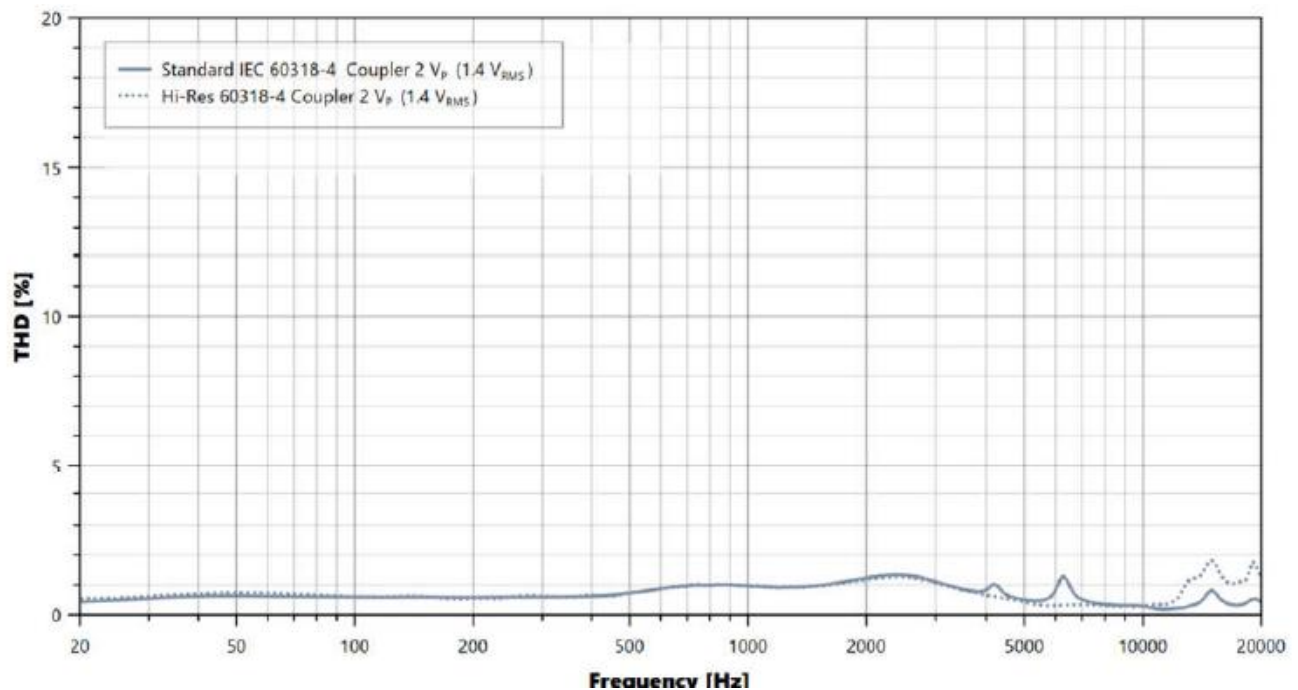
Coupler adapter cross-section. The speaker adapter is directly screwed onto the coupler; the ear mold adapter is not used.

The outlet for the speaker is round with a diameter of 4 mm and length of 1.5 mm.

FREQUENCY CHARACTERISTICS



SPL at 1.4 VRMS (2Vp) drive and 9.5 VRMS (13.5 Vp) drive, measured with the standard 711-Coupler (IEC 60318-4) and the Hi-Res Coupler from GRAS. The latter replicates the frequency response above 10 kHz more accurately



THD at 1.4 VRMS (2Vp) drive, measured with the standard 711-Coupler (IEC 60318-4) and with the Hi-Res Coupler from GRAS. The latter replicates the THD above 3 kHz more accurately.

CONNECTIVITY

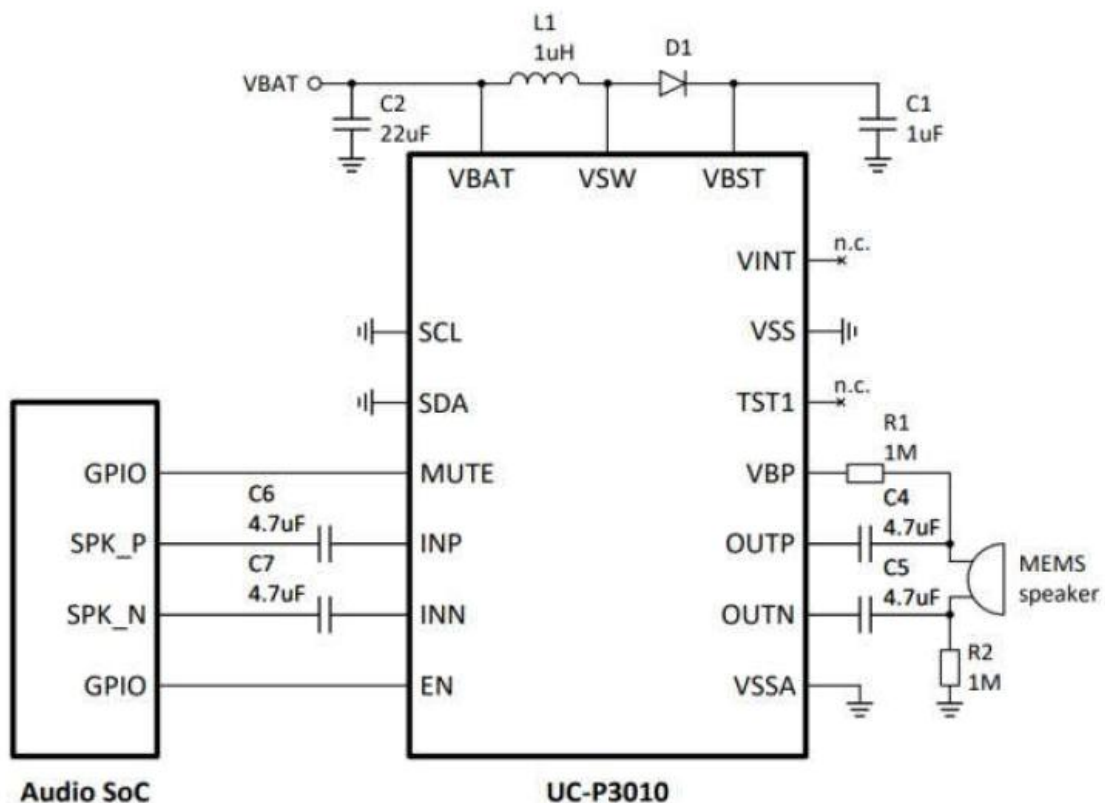
The speaker is driven by applying a voltage between the (+) and the (-) contacts. The bigger pad corresponds to the negative input, the smaller pad to the positive (Figure).

A positive voltage on the positive pad will result in the membrane moving up (away from the pads).

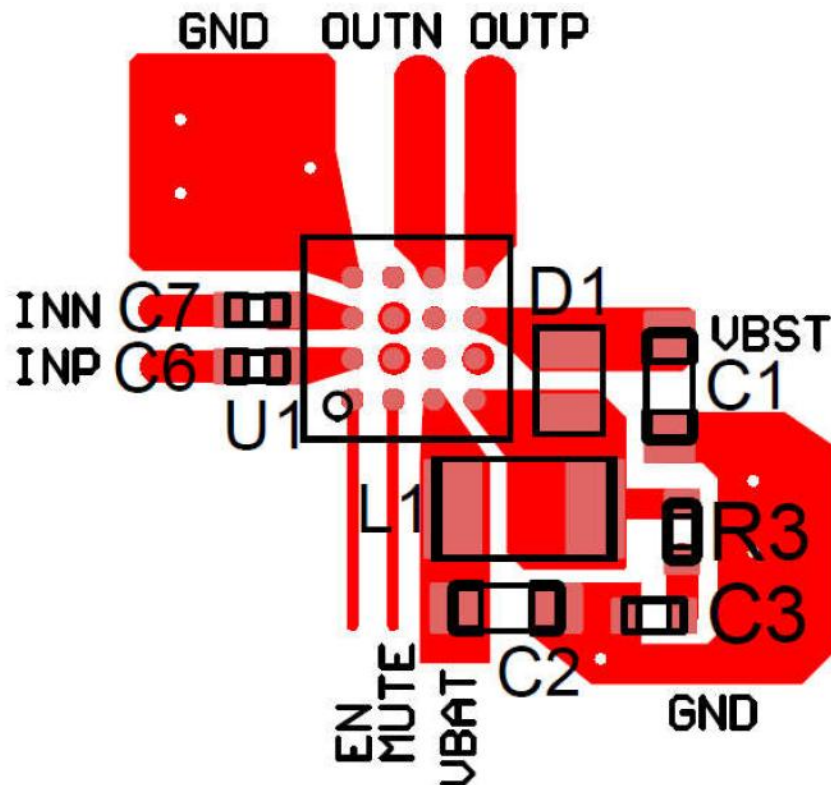


Electrical contacts of the MEMS speaker.

TYPICAL APPLICATION CIRCUIT



RECOMMENDED PCB LAYOUT



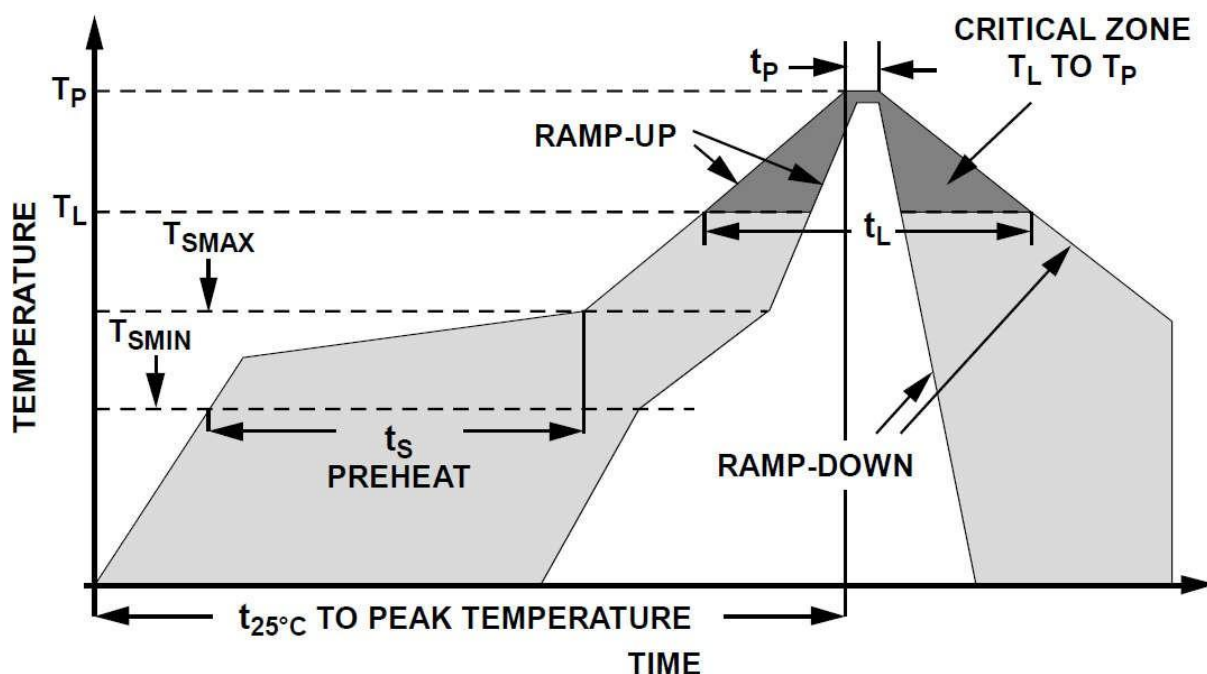
The analog outputs of a typical Audio (Bluetooth) SoC processor are connected to the inputs of UC-P3010 through two capacitors. The amplifier is self-configured at power on (EN=1). The I2C interface to the SoC is optional in case the user intends to re-write the stored default configuration.

The input capacitors C6 and C7 as well as the output capacitors C4 and C5 linearity (minimal change of capacitance over voltage) is important for minimal contribution to the THD, typically achieved with higher voltage rating ceramic capacitors.

LAYOUT GUIDELINE:

A low-impedance compact PCB layout design is required in the DC-DC part. This includes the pins VSW, VSS, VBST, the inductor L1 and the Schottky diode D1. Design a short and wide connection for VSW (L1-D1) and VBAT, especially in the connectivity of the boost diode (D1), boost Inductor (L1), boost capacitor (C1) and VBAT bypass capacitor (C2). Components C3 and R3 require a very short and wide connection as well to function appropriately. The unused pins B2 and B3 should be grounded. The unused pins C3 and B4 should be floating.

RECOMMENDED PCB LAYOUT



Parameter		Reference	Specification
Average Ramp Rate		T_L to T_P	3°C/sec max
Preheat	Minimum Temperature	T_{SMIN}	110°C
	Maximum Temperature	T_{SMAX}	145°C
	Time T_{SMIN} to T_{SMAX}	t_s	60 sec
Ramp-Up Rate		T_{SMAX} to T_L	3°C/sec
Liquidous Temperature		T_L	157°C
Peak Temperature		T_P	200°C
Ramp-Down Rate		T_P to T_{SMAX}	6°C/sec max
Time +25°C ($t_{25^\circ C}$) to Peak Temperature			240 sec

SPECIAL CAUTIONS

GENERAL

It needs to be considered that MEMS devices consist of silicon structures, and therefore, they should be handled with care. Any bending of the MEMS speakers must be avoided while handling during the assembly process, otherwise the speaker can be damaged.

HANDLING

Careful handling of these speakers is recommended to avoid damage. Use tweezers or a similar tool, applying light contact to the speaker's side wall.

HAND SOLDERING

Improper soldering of MEMS speakers at high temperatures can potentially damage the component. Apply soldering iron only on the electrical pads on the bottom side of the speaker during the soldering process. It is recommended to follow the standard IPC J-STD-001 "Requirements for Soldered Electrical and Electronic Assemblies." For inspection, it is suggested to follow IPC-A-610G.

Type	Recommended Parameters	Comments
Soldering Temperature 340°C	340°C	-
Soldering Time	1-2 s	Maximum 5s

APPROVAL

DRAWN BY	AR, July 4, 2025
APPROVED BY	CP, July 4, 2025
REVISION	A, Initial Release



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