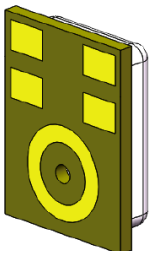
PUIaudio



Data Sheet DMM-3526-2-B

Features:

The DMM-3526-2-B digital MEMS microphone features a specialized pre-amplification ASIC that provides high sensitivity and high SNR output from a capacitive audio sensor. It's packaged for surface mounting and high temperature reflow assembly. The digital data format is single-bit PDM.

- -26dBFS sensitivity
- 65dB Signal-to-Noise
- Digital PDM output
- Small 2.65mm x 3.50mm surface-mount package

Specifications (f_{CLOCK} = 2.4MHz, V_{DD} = 1.8V, unless otherwise specified.)

Parameter	Test Condition	Value	Unit
Sensitivity	94dBSPL f_{IN} = 1 kHz All operating modes	-27 (min) -26 (typ) -25(max)	dBFS
Supply Voltage		1.8 (typ)	V_{DD}
Supply Voltage Range		1.62 (min) 3.6 (max)	V_{DD}
Supply Current	V_{dd} = 1.8V f_{SAMPLE} = 3.072MHz	650 (typ) 1000 (max)	µA
Signal-to-Noise Ratio	f_{IN} = 1kHz, 94dBSPL, A-weighted	65 (typ)	dB
Frequency Range	See Frequency Response Curve for response limits	20 – 20k	Hz
Total Harmonic Distortion	f_{IN} = 1 kHz, 94dBSPL	0.15 (typ) 0.5 (max)	%
Acoustic Overload Point (AOP)	(1kHz, 10% THD)	120 (typ) 121 (max)	dB
Power Supply Rejection	100mV_{PP} 217 Hz square wave on V_{DD}, A-weighted	-90 (typ)	dB
Input-Referred Noise		3.5 (typ)	µV

Phase Response	94dBSPL 50Hz < f_{IN} < 2000Hz	-5 (min) 5 (max)	°

Specifications (f_{CLOCK} = 768kHz, V_{DD} = 1.8V, unless otherwise specified.)

Parameter	Test Condition	Value	Unit
Sensitivity	94dBSPL f_{IN} = 1 kHz All operating modes	-27 (min) -26 (typ) -25 (max)	dBFS
Supply Voltage		1.8 (typ)	V_{DD}
Supply Voltage Range		1.6 (min) 3.6 (max)	V_{DD}
Supply Current	V_{dd} = 1.8V f_{SAMPLE} = 768kHz	350 (typ) 450 (max)	µA
Signal-to-Noise Ratio	f_{IN} = 1kHz, 94dBSPL, A-weighted	63 (typ)	dB
Frequency Range	See Frequency Response Curve for response limits	20 – 20k	Hz
Total Harmonic Distortion	f_{IN} = 1kHz, 94dBSPL	0.17 (typ) 0.5 (max)	%
Acoustic Overload Point (AOP)	(1kHz, 10% THD)	120 (typ) 121 (max)	dB
Power Supply Rejection	100mV_{PP} 217 Hz square wave on V_{DD}, A-weighted	-89 (typ)	dB

Physical Properties

Parameter	Condition	Value	Unit
Directivity		Omnidirectional	
Weight		0.03 (max)	Grams
Operating Temperature		-40 (min) 85 (max)	°C
Storage Temperature	Humidity < 75%	-40 (min) 100 (max)	°C
MSL (Moisture Sensitivity Level)*		Class 1	
Acceptable Soldering Methods		See page for reflow soldering information	
Environmental Compliances		RoHS/Halogen Free	

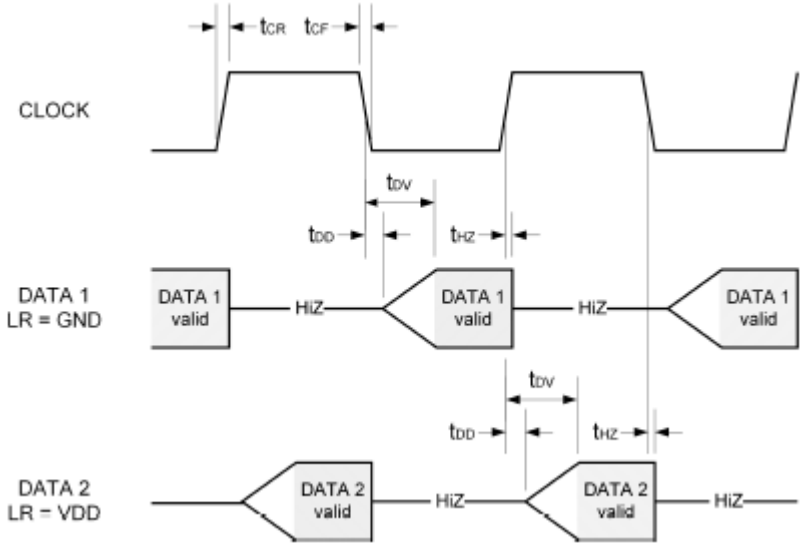
*MSL level dependent on product remaining in sealed packaging until use

Operating Ratings

Parameter	Test Condition	Value	Unit
Power Supply Voltage (V_{DD})		1.62 (min) 3.6 (max)	V
Clock Frequency Range (f_{CLOCK})	Sleep Mode	0 (min) 350 (max)	kHz kHz
	Lower Power Mode	512 (min) 768 (typ) 850 (max)	
	Standard Mode	1.38 (min) 3.3 (max)	MHz
Clock Duty Cycle	Note 1	45 (min) 55 (max)	%
Input Logic High Level		0.65•V_{DD} (min) V_{DD}+0.3 (max)	V
Input Logic Low Level		-0.3 (min) 0.35•V_{DD} (max)	
Output Logic High Level		0.7•V_{DD} (min)	V
Output Logic Low Level		0.3•V_{DD} (max)	
Output Logic Load Capacitance		200 (max)	pF
Data Valid Time		20 (max)	ms ms
Wake-Up Time		20 (max)	
Time After Stable Clock to Achieve Specified Sensitivity	Sensitivity, ±0.2dB	20 (min)	
Supply Current	Clock is off	1 (typ 35 (max)	µA
	Standby	25 (typ) 50 (max)	
Short Circuit Current	Data Output Pin		mA
	VDD = 1.2V	1 (min) 13 (max)	
	VDD = 1.8V	1 (min) 20 (max)	

Note 1: For f_{CLOCK} £ 2.7MHz, the duty-cycle must be in the 45% to 55% range. For f_{CLOCK} > 2.7MHz, the duty-cycle must be 48% - 52%.

Timing Characteristics



Parameter	Test Condition	Value	Unit
Clock Timing Characteristics			
Clock Duty Cycle (DC_{CLOCK})	f_{CLOCK} ≤ 2.7MHz	45 (min) 55 (max)	%
	f_{CLOCK} > 2.7MHz	48 (min) 52 (max)	%
Clock Rise Time (t_{CR})	10% to 90%	13 (max)	ns
Clock Fall Time (t_{CF})	90% to 10%	13 (max)	ns
Data Timing Characteristics			
Time Delay Between Clock Edge and Data Line Driven (t_{DD})	Clock Edge Magnitude = 50%V_{DD}	40 (min) 80 (max)	ns
Time Delay to Valid Data [Normal Mode] (t_{DV})	DV_{DD} Digital Interface: f_{CLOCK} = 768kHz, 2.0MHz, 3.072MHz, or 4.0MHz Internal 1.2V Digital Interface: f_{CLOCK} = 2.0MHz, 3.072MHz, or 4.0MHz	100 (max)	ns
Time Delay to High Impedance (t_{HZ})	DV_{DD} Digital Interface	5 (min) 30 (min)	ns
Time Delay to High Impedance [Internal 1.2V Mode] (t_{HZ_1V2IO})	Internal 1.2V Digital Interface	14 (min) 22 (min)	ns
Short Circuit Output Current		20 (max)	mA
Time to Sleep	f_{CLK} < 250kHz	10 (max)	ms
Time to Wake	f_{CLK} > 350kHz	15 (max)	ms
Time from Power Valid to Operation		50 (max)	ms
Time to Change Mode		10 (max)	ms
Time to Valid VDD	$V_{DD} \geq V_{DD\_min}$	50 (max)	ms

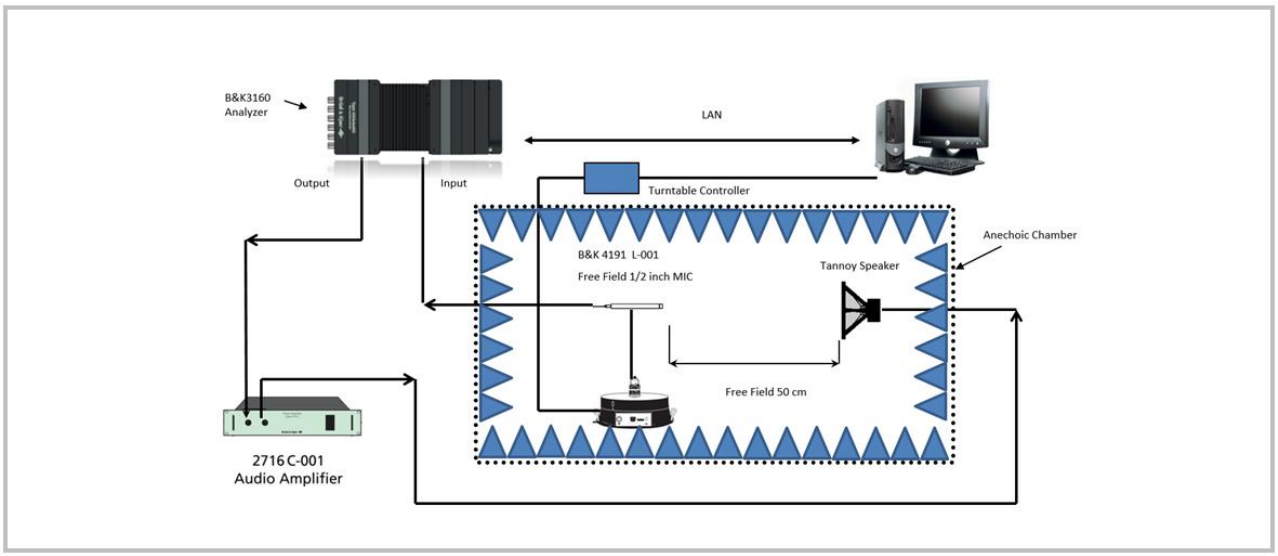
Power-On Time to Idle Data Pattern		4 (max)	ms
Startup Time (Note 2)	Sensitivity accuracy = ±0.5dB	20	ms
	Sensitivity accuracy = ±0.2dB	50	
Reset Time (Note 3)	Sensitivity accuracy = ±0.5dB	20	
	Sensitivity accuracy = ±0.2dB	50	
Mode Switch Time (Note 4)	Sensitivity accuracy = ±0.5dB	20	
	Sensitivity accuracy = ±0.2dB	50	

Note 2: Any mode after V_{DD} and CLOCK are applied.
Note 3: Any mode after V_{DD} = 0V for greater than 10ms; CLOCK remains on.
Note 4: Switching between any mode; 1.6V ≤ V_{DD} ≤ 3.6V.

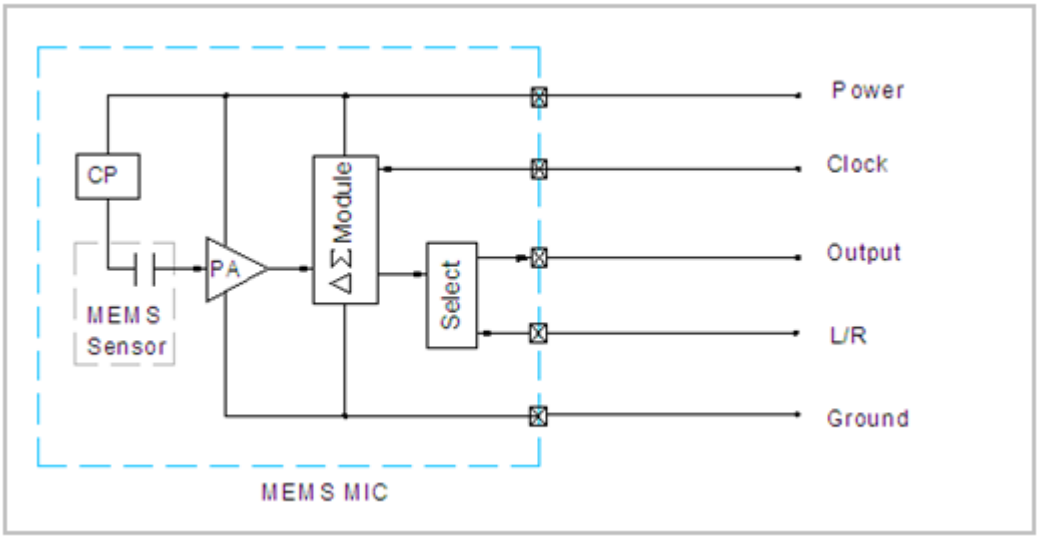
Absolute Maximum Ratings

Parameter	Condition	Value	Unit
Supply Voltage		3.6	V_{DC}
Max Voltage on Any Pin		3.6	V_{DC}
Max Sound Pressure Level		160	dB
Max Mechanical Shock		10000	G
Max Vibration		Pre-MIL-STD-883 Method 2007, Test Condition B	

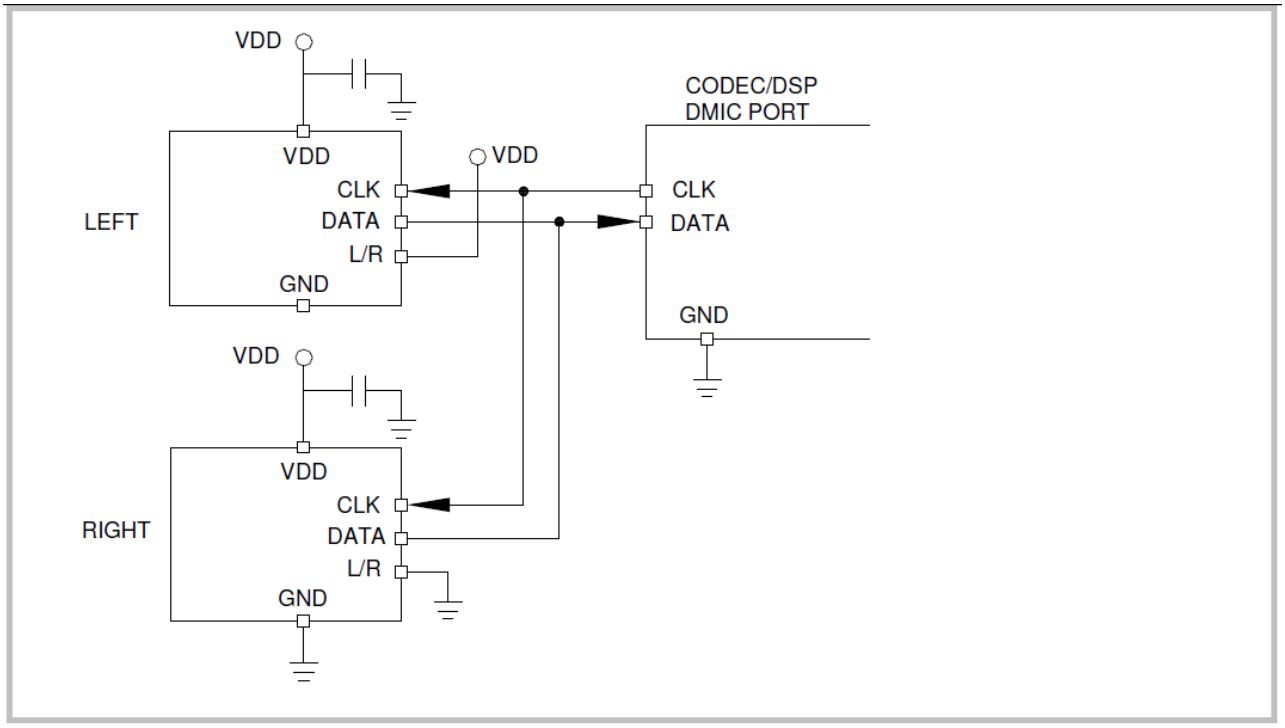
Measurement Method



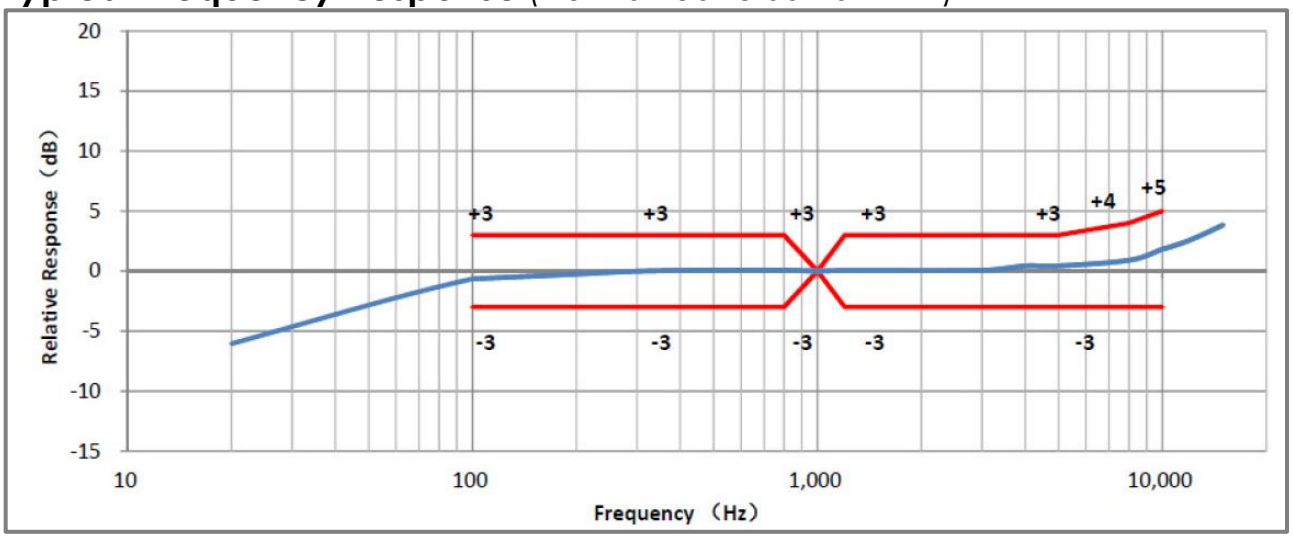
Measurement Circuit



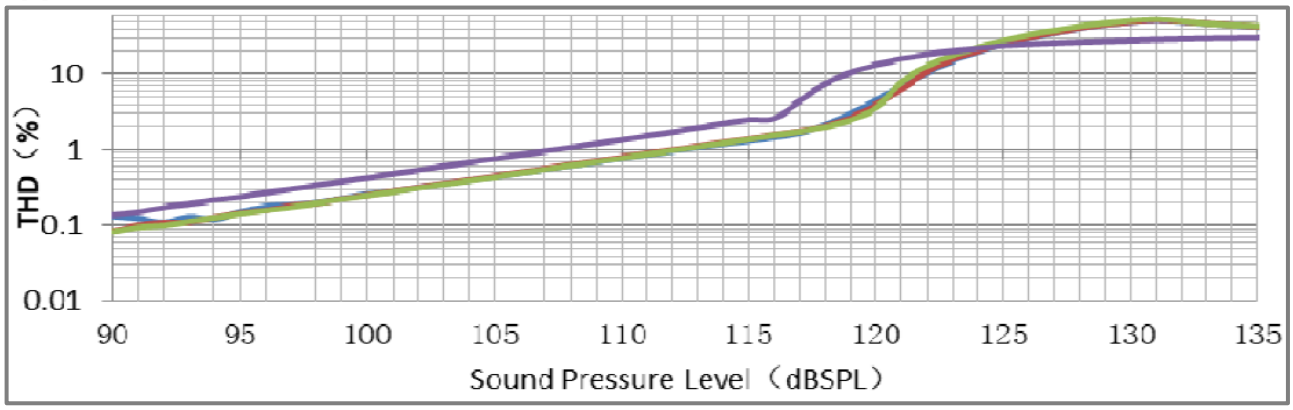
Connection Diagram



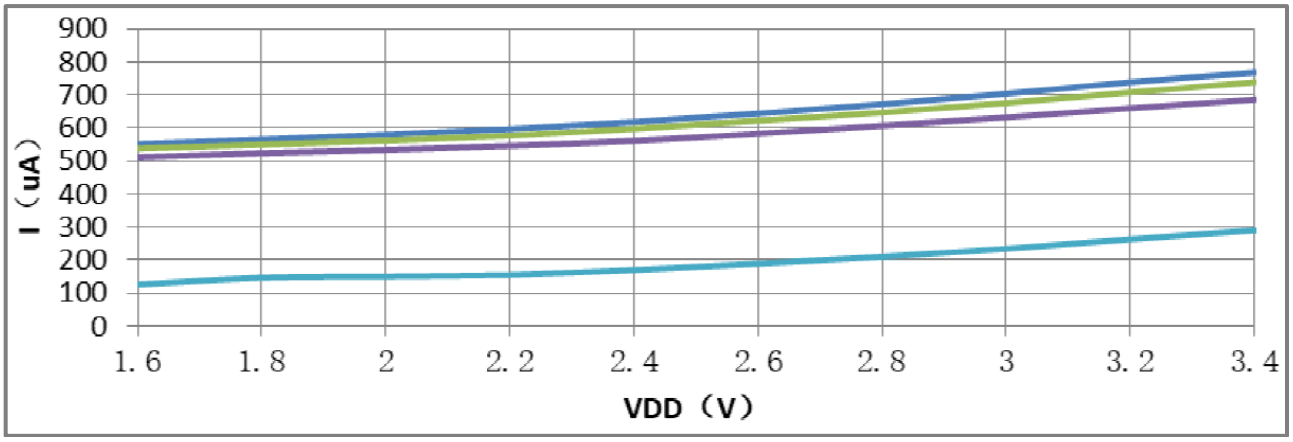
Typical Frequency Response (Normalized to 0dB at 1kHz)



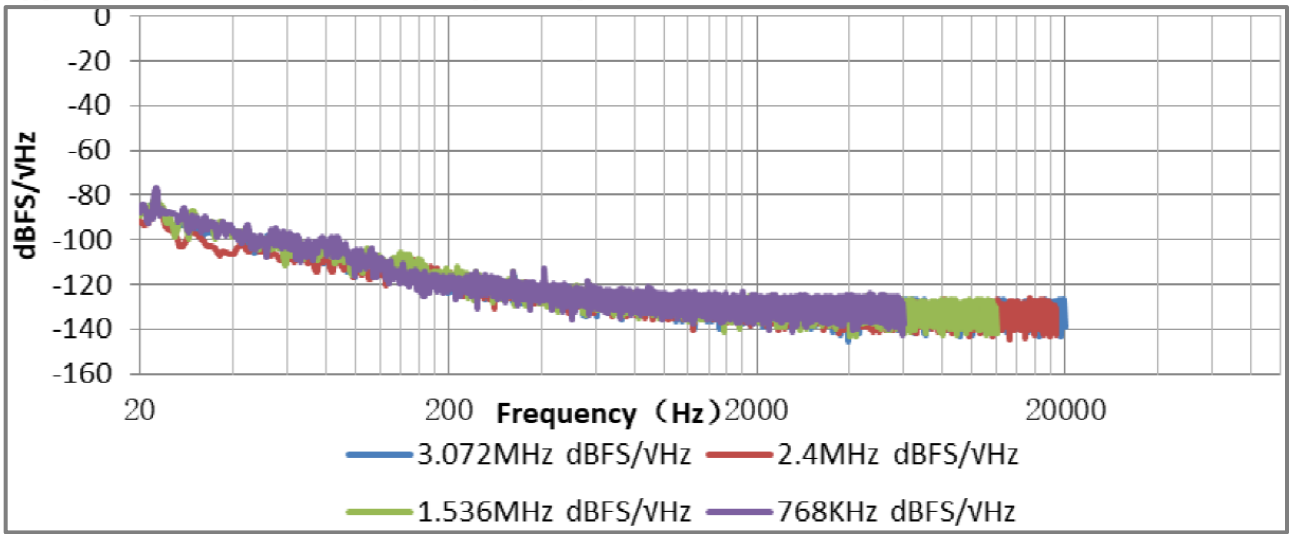
Typical THD vs. Sound Pressure Level



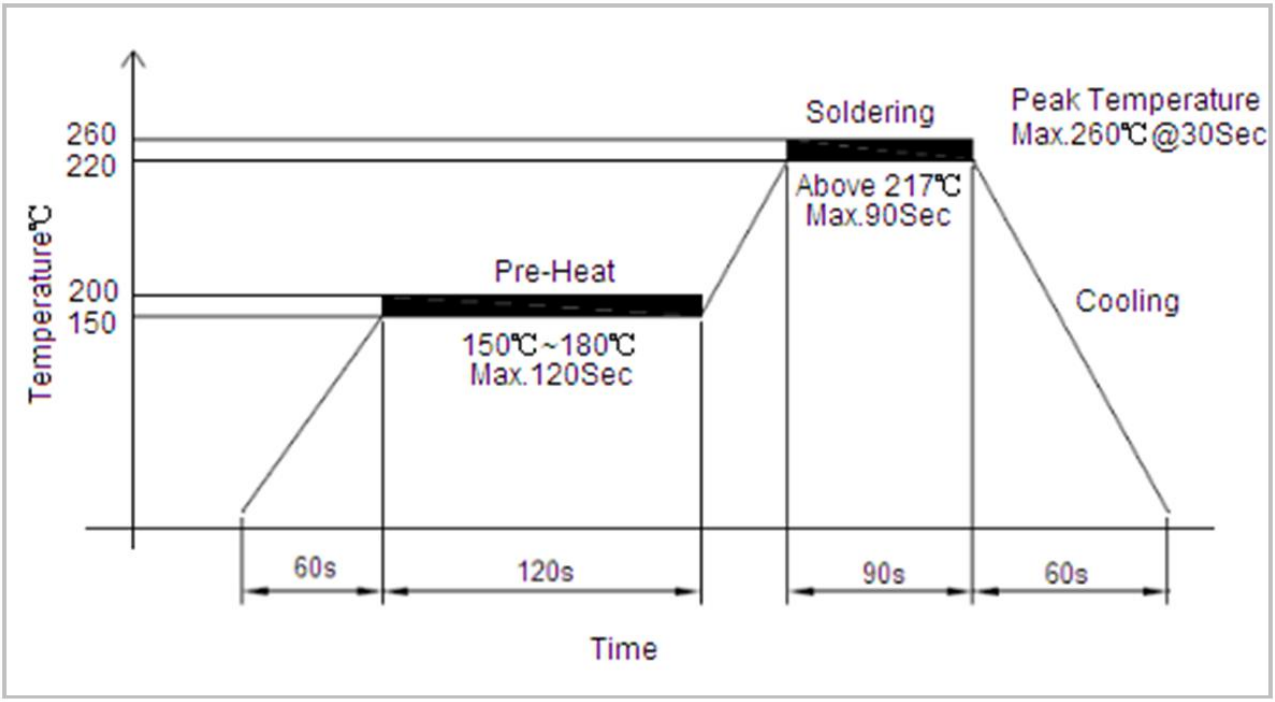
Typical Power Supply Current vs. Power Supply Voltage



Typical Noise/$\sqrt{Hz}$ vs. Frequency (Unweighted)



Recommended Reflow Soldering Procedure (Recommended profile, temperature ≤ 260°C, 30s maximum at peak temperature.)



Important notes to minimize device damage:

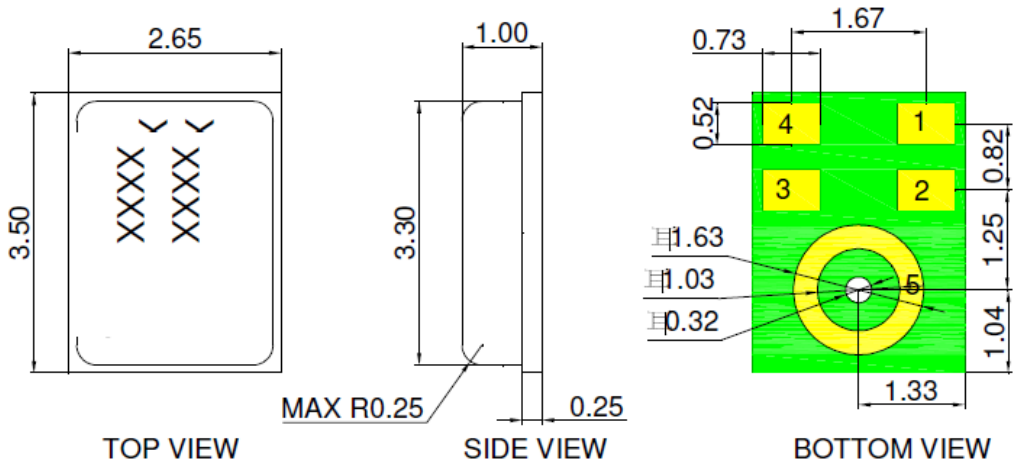
1. Do not handle the microphone with pick-and-place vacuum tools that could contact the microphone acoustic port hole.
2. Never expose the microphone's acoustic port hole to vacuum. Such exposure can damage or destroy the MEMS element.
3. Never allow air to blow air into the microphone acoustic port hole. The port hole must be sealed to prevent particle contamination if a blown air-cleaning process is used,
4. A clean room environment is recommended for PCB assembly to avoid microphone contamination.
5. Do not use blown air or ultrasonic cleaning procedures on MEMS Microphones. A no-clean paste is recommended for the assembly, avoiding subsequent cleaning steps. cleaning substances can severely damage the microphone MEMS element.
6. it is recommended to cover the sound port with protective tape during PCB sawing or system assembly. This prevents blocking or partially blocking the acoustic port hole during PCB assembly.
7. Do not use excessive force to place the microphone on the PCB. Use industry standard pick and place tools to limit the mechanical force exerted on the package.

Reliability Testing (Samples under test are acclimated at T_A = 23±2°C, R.H. = 55±10% for two hours. After each test completes and corresponding recovery time (if applicable) elapses, any measured sensitivity change is ≤±3dB, unless otherwise specified.)

Type of Test	Test Specifications
High Temperature Storage Test	1000hrs at 105±3°C Two-hour recovery
High Temperature Operational Test	1000hrs at 105±3°C V_{DD} = V_{DD} (max), Four-hour recovery
Low Temperature Storage Test	1000hrs at -40±3°C. Two-hour recovery
Low Temperature Operational Test	1000hrs at -40±3° V_{DD} = V_{DD} (max) Four-hour recovery
Temperature Shock	Thirty cycles, each from cold to hot Each cycle is thirty minutes at -40°C, thirty minutes at 125°C Five-minute transition
Temperature-Cycle, Thermal Shock Test	Double-case method: 15min at -40±3°C Followed by 15min at 125±3°C 100 cycles Two-hour recovery
High Humidity, High Temperature Operating Test	1000hrs at 85±3°C and 85%R V_{DD} = V_{DD} (max) Twelve-hour recovery No corrosion or defamation inside the microphone
High Humidity, High Temperature Operating Test	168hrs at 65±3°C and 95%RH V_{DD} = V_{DD} (max) Twelve-hour recovery No corrosion or defamation inside the microphone
Static Humidity	One hour at 25°C precondition 1000hrs at 85±3°C and 85%RH Dry at room ambient temperature
Vibration Test	Twelve minutes along the X, Y, and Z axis f_{IN} = 20Hz to 2kHz 20G peak acceleration Two-hour recovery Less than 1dB sensitivity change
Mechanical Shock	Half-sine shock pulses 3000G±15%, 300μs Eighteen total shocks
Shock Test	Height: 1.5m Fixture weight: 150±10g Fixture's sound hole diameter is ≥0.8mm Reference surface is marble floor

	Duration: four corners x four times; six faces x four times Less than 1dB sensitivity change
Drop Test	Repeated three times in six directions (total drops is eighteen). Dropped onto a steel surface from 1.5m height Inspect for mechanical damage Less than ±3dB sensitivity variation after each drop
Random Vibrations	Random vibrations on three perpendicular axis Four cycles, 20Hz to 2kHz 20G peak acceleration Thirty minutes per axis
Structure Shock Test	10000G Pulse width = 0.1ms X, Y, and Z axis Three times along each axis Sensitivity change less than 1dB
Air Pressure Test	Air pressure = 0.3MPa Distance = 3cm Time = 10sec Air discharge port diameter exceeds microphone's acoustic port diameter
Simulated Reflow (without solder)	Samples are qualified with three 260±5°C reflow profile passes Two hours of settling is required between each reflow profile test
ESD Sensitivity	Measured according to MIL-STD-883G, Method 3015.7, Human Body Model (HBM) Identify ESD threshold levels indicating 3000V HBM passage.
Operational Life	Samples tested at 125°C for 168hrs at $V_{DD(MAX)}$

Dimensions (mm)

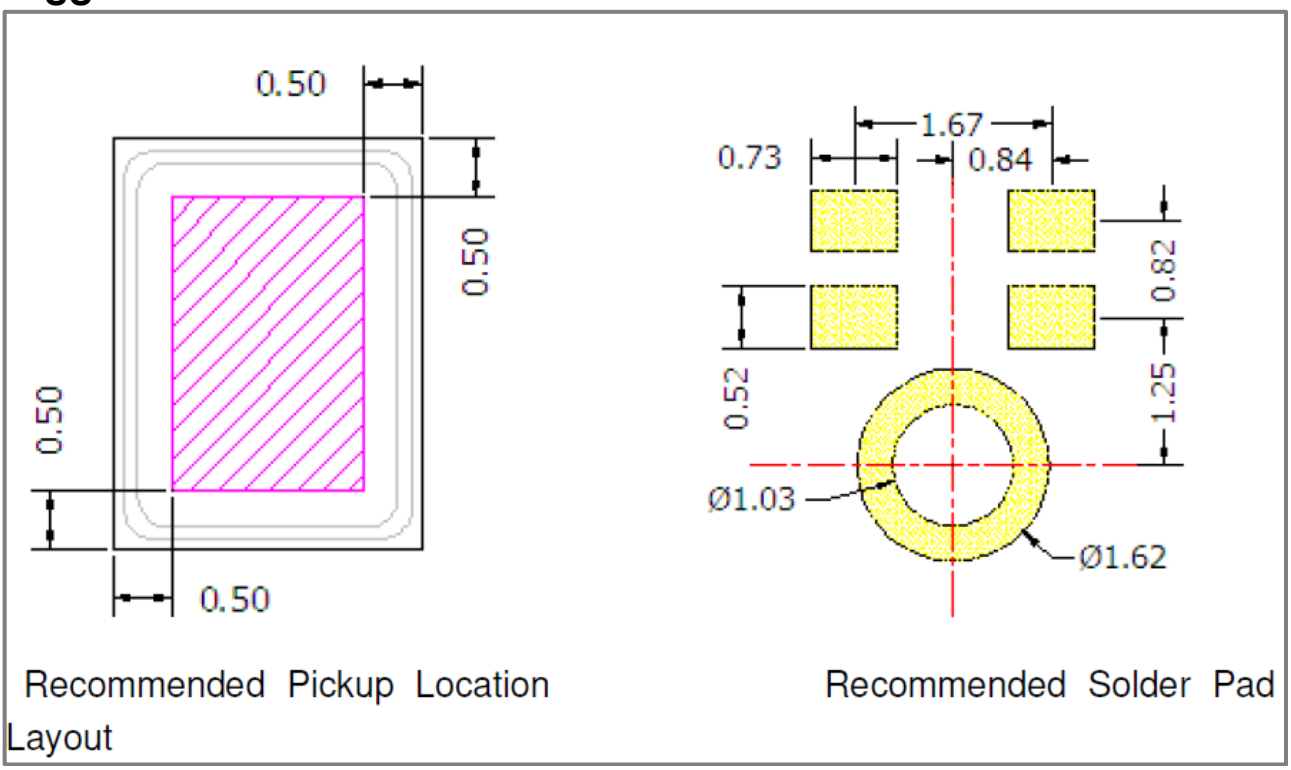


Laser Mark	Description
XXXX XXXX	Date Code

Item	Dimension	Tolerance(+/-)	Units
Length(L)	3.50	0.10	mm
Width(W)	2.65	0.10	mm
Height(H)	1.00	0.10	mm
Acoustic Port(AP)	Ø0.32	0.05	mm

Pin #	Pin Name	Type	Description
1	Output	Signal	Output Signal
2	L/R	L/R Channel	Channel select
3	CLK	Clock	Clock input
4	V_{DD}	Power	Power Supply
5	GND	Ground	Ground

Suggested Land Pattern*

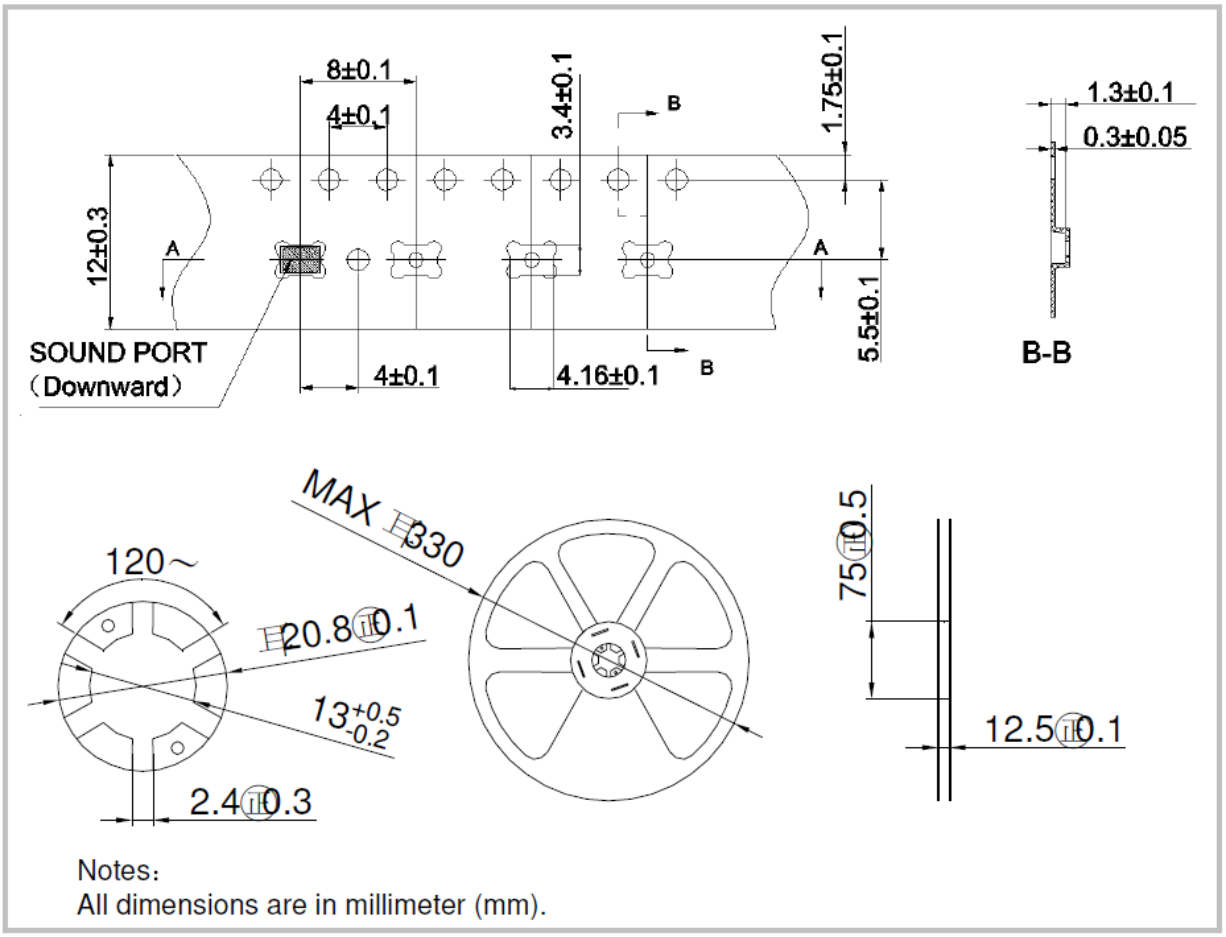


Recommended Pickup Location Layout

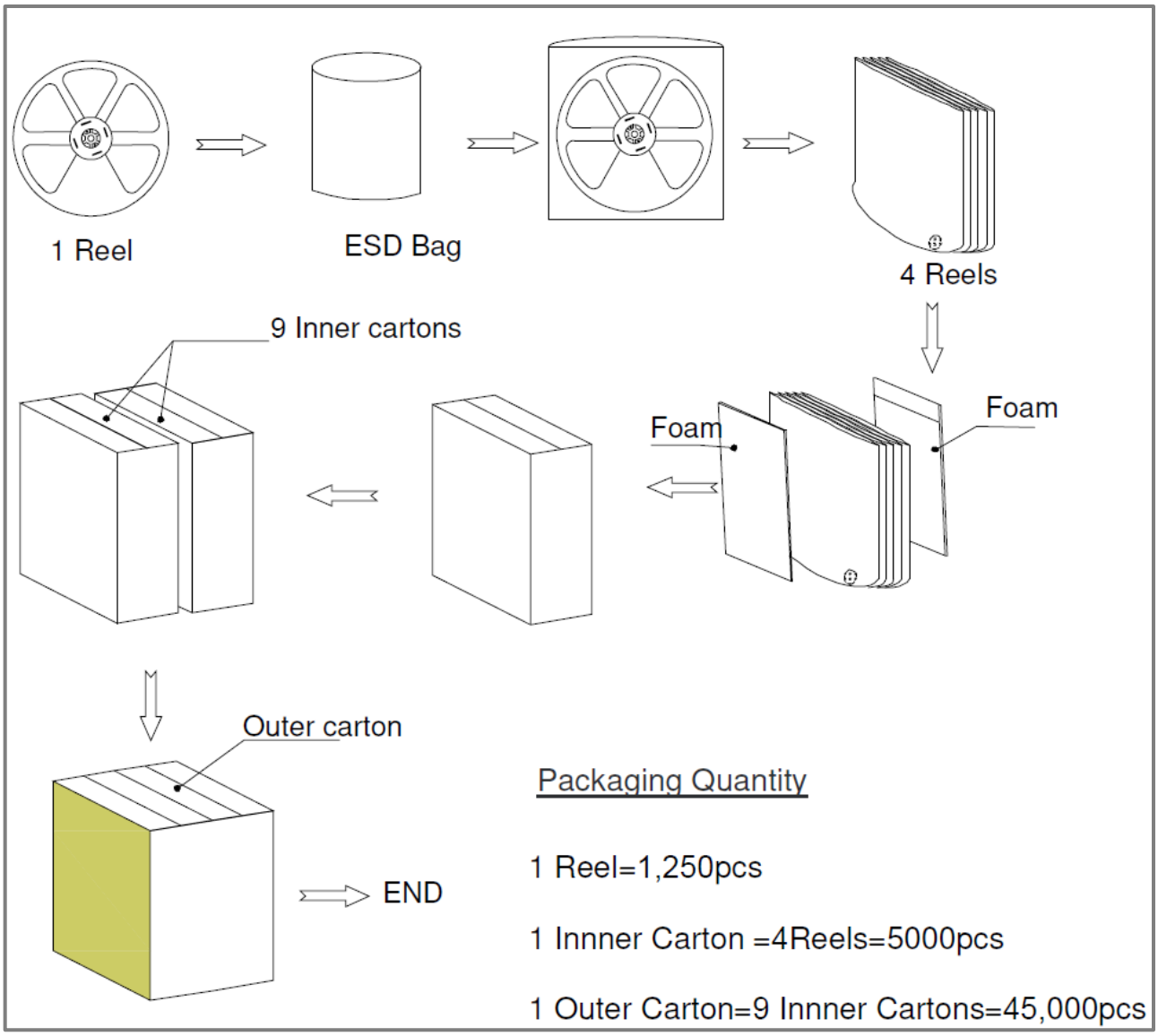
Recommended Solder Pad

*This land pattern is advisory only and its use or adaptation is entirely voluntary. PUI Audio disclaims all liability of any kind associated with the use, application, or adaptation of this land pattern.

Packaging



Notes:
All dimensions are in millimeter (mm).



Specifications Revisions

Revision	Description	Date
A	Preliminary Release from Engineering	05-04-2023

Note:

1. Unless otherwise specified:
   A. All dimensions are in millimeters.
   B. Default tolerances are ±0.5mm and angles are ±3°.
2. Specifications subject to change or withdrawal without notice.
3. This part is ROHS 2015/863/EU compliant.