



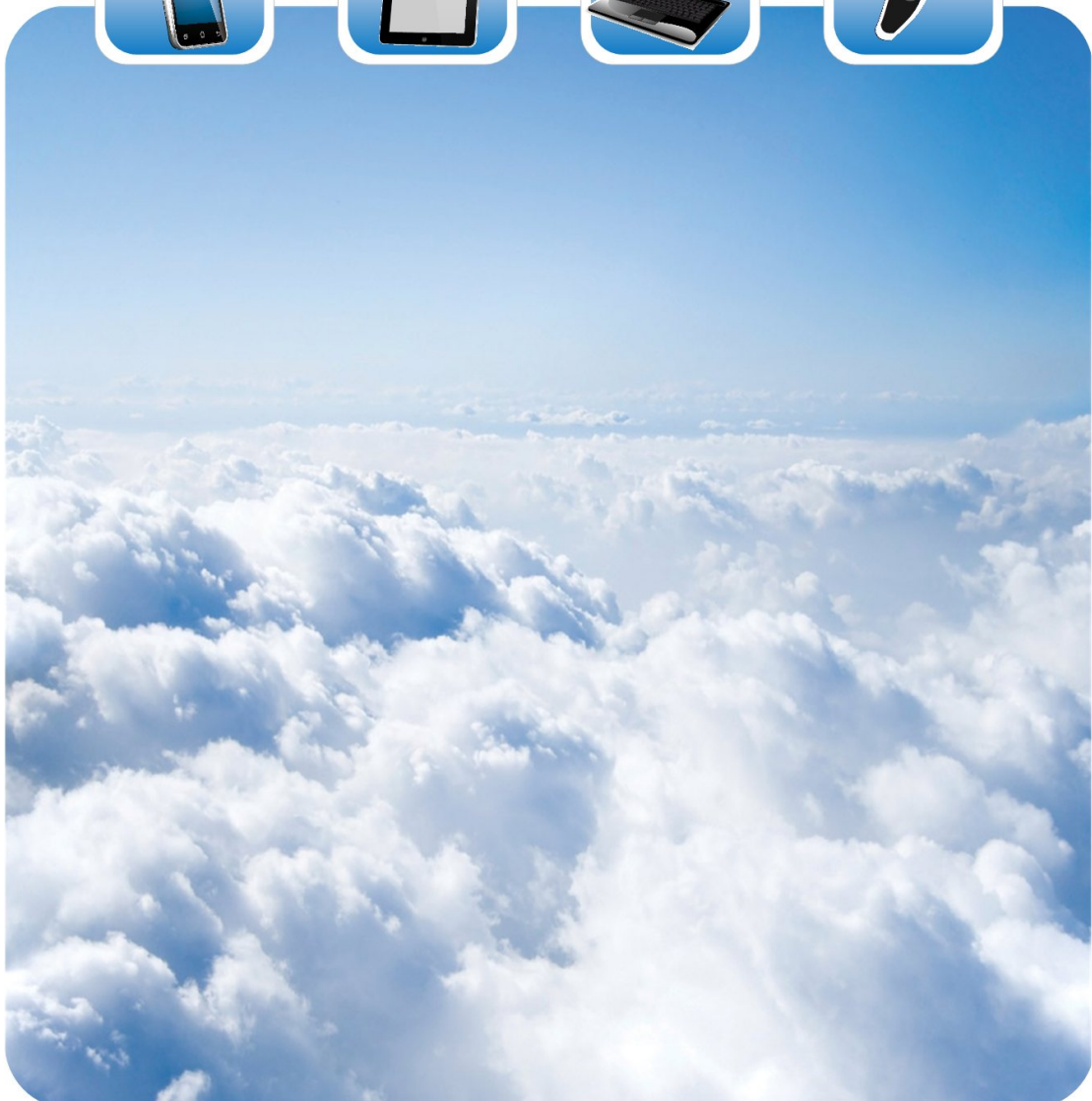
苏州敏芯微电子技术股份有限公司  
MEMSensing Microsystems (Suzhou, China) Co., Ltd.

# Data Sheet

V 1.3 / Oct. 2017

MSM261D3526Z1A

PDM digital output MEMS microphone with Multi-modes



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# MSM261D3526Z1A

PDM digital output MEMS microphone



## GENERAL DESCRIPTION

MSM261D3526Z1A is an omnidirectional, Bottom-ported, PDM digital output MEMS microphone. It has high performance and reliability. The MSM261D3526Z1A offers multiple performance modes.

MSM261D3526Z1A is available in a 3.50 mm × 2.65 mm × 0.98 mm metal cap LGA package. It is SMT compatible with no sensitivity degradation.

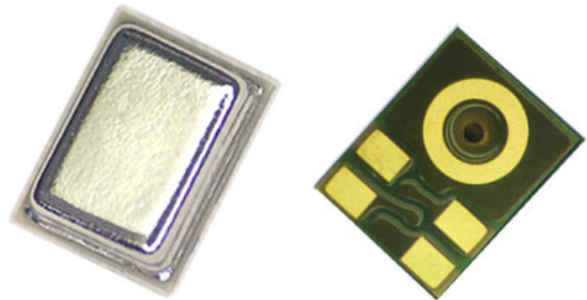
## APPLICATIONS

- ✧ Mobile Phone
- ✧ Laptop
- ✧ Tablet computer
- ✧ Bluetooth headset
- ✧ Earphone
- ✧ Wearable intelligent equipment

## FEATURES

- ✧ Cost effective
- ✧ Fourth-order  $\Sigma$ - $\Delta$  modulator
- ✧ Digital PDM output
- ✧ Compatible with Sn/Pb and Pb-free solder processes
- ✧ RoHS/Halogen free compliant
- ✧ Multiple performance modes (Sleep, Low-Power, Standard Performance)
- ✧ Sensitivity Matching within +/-1dB

## PRODUCT VIEW



**MSM261D3526Z1A**  
PDM digital output MEMS microphone



**ABSOLUTE MAXIMUM RATINGS**

Parameter	Maximum value	Unit
Supply Voltage	-0.3 to 4.0	V
Sound Pressure Level	140	dB SPL
Temperature Range	-40 to 100	°C
Electrostatic discharge protection	2 (HBM)	kV

**ACOUSTIC & ELECTRICAL SPECIFICATIONS**

TEST CONDITIONS: 23 ±2°C, 55±20% R.H., VDD=1.8 V, fCLOCK=2.4 MHz, SELECT pin grounded, no load, unless otherwise indicate

**General Microphone Specifications**

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	V <sub>DD</sub>		1.6	-	3.6	V
Clock Frequency Range	Sleep Mode		0		50	KHz
	Low-Power Mode		150		900	KHz
	Standard Performance Mode		1.1		4.0	MHz
Sleep Current	I <sub>SLEEP</sub>	f <sub>CLOCK</sub> ≤ 50 kHz	-	1		µA
DC Output		Fullscale = ±100	-	4	-	% FS
Directivity			Omnidirectional			
Polarity		Increasing sound	Increasing density of 1's			
Data Format			½ Cycle PDM			
Short Circuit Current	I <sub>SC</sub>	Grounded DATA pin	1	-	10	mA
Output Load	C <sub>LOAD</sub>		-	-	200	pF
Fall-asleep Time		f <sub>CLOCK</sub> ≤ 50 kHz	-	-	30	µs
Wake-up Time		f <sub>CLOCK</sub> ≥ 151 kHz	-	-	200	µs
Power-up Time		V <sub>DD</sub> ≥ V(min)	-	-	50	ms
Mode-Change Time			-	-	10	ms

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**Standard Performance Mode**

TEST CONDITIONS:  $f_{\text{CLOCK}} = 2.4 \text{ MHz}$ ,  $V_{\text{DD}} = 1.8 \text{ V}$ , unless otherwise indicated

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Current	$I_{\text{DD}}$	$f_{\text{CLOCK}} = 2.4 \text{ MHz}$	-	670	-	$\mu\text{A}$
Sensitivity	S	94 dB SPL @ 1 kHz	-27	-26	-25	dBFS
Signal to Noise Ratio	SNR	20 kHz bandwidth, A-weighted $f_{\text{CLOCK}} = 2.4 \text{ MHz}$	-	64	-	dB(A)
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz, S = Typ	-	0.2	-	%
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = Typ	-	120	-	dB SPL
Power Supply Rejection Ratio	PSRR	200 mVpp sine wave @ 1 kHz	-	50	-	dBV/FS
Power Supply Rejection	PSR+N	100 mVpp square wave @ 217 Hz, A-weighted	-	-80	-	dBFS(A)



### Low-Power Mode

TEST CONDITIONS:  $f_{\text{CLOCK}} = 768 \text{ kHz}$ ,  $V_{\text{DD}} = 1.8 \text{ V}$ , unless otherwise indicated

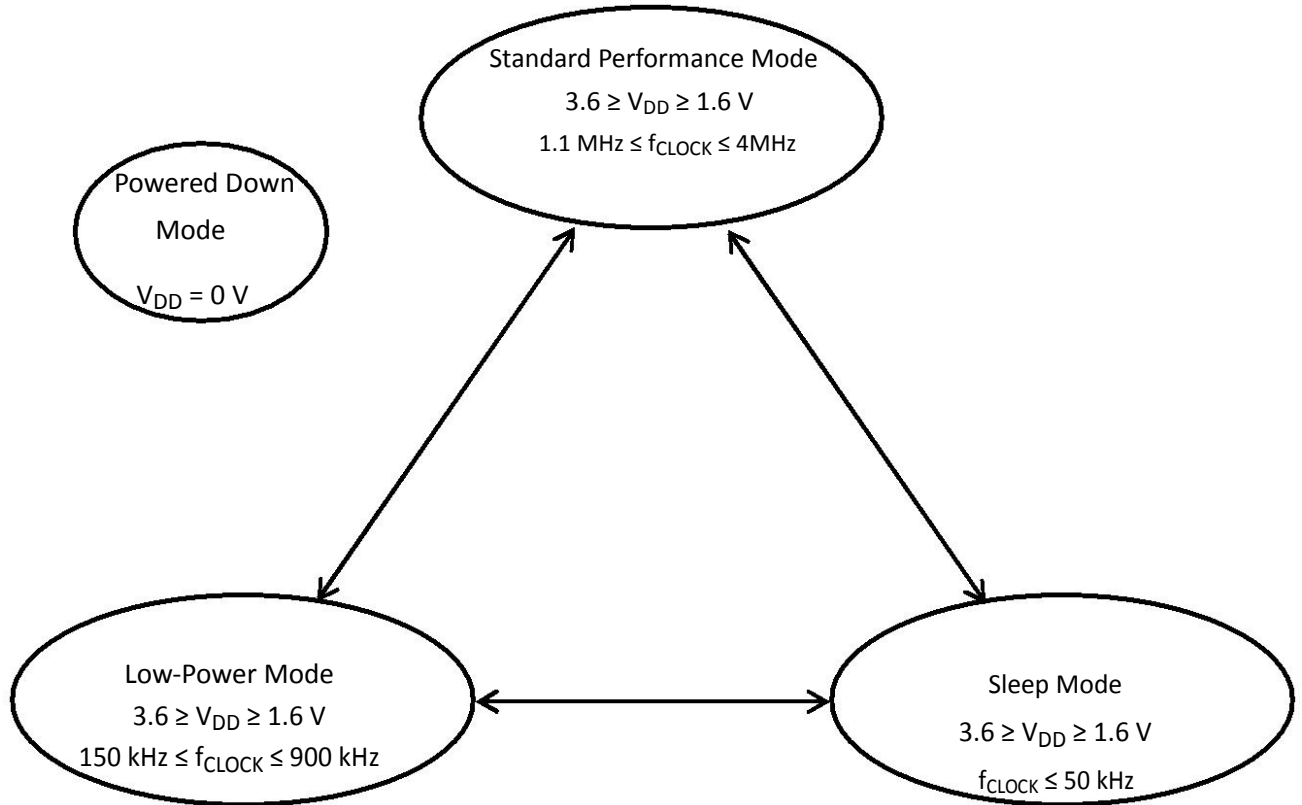
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Current	$I_{\text{DD}}$	$f_{\text{CLOCK}} = 768 \text{ KHz}$	-	290	-	$\mu\text{A}$
Sensitivity	S	94 dB SPL @ 1 kHz	-26	-25	-24	dBFS
Signal to Noise Ratio	SNR	94 dB SPL @ 1 kHz, A-weighted(20Hz-8KHz)	-	62	-	dB(A)
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz, S = Typ	-	0.2	-	%
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = Typ	-	120	-	dB SPL
Power Supply Rejection Ratio	PSRR	200 mVpp sinewave @ 1 kHz	-	50	-	dBV/FS
Power Supply Rejection	PSR+N	100 mVpp square wave @ 217 Hz, A-weighted(20Hz-8KHz)	-	-80	-	dBFS(A)

### Microphone Interface Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Logic Input High	$V_{\text{IH}}$		$0.7 \times V_{\text{DD}}$	-	3.6	V
Logic Input Low	$V_{\text{IL}}$		-0.3	-	$0.3 \times V_{\text{DD}}$	V
Logic Output High	$V_{\text{OH}}$	$I_{\text{OUT}} = 2 \text{ mA}$	$V_{\text{DD}} - 0.45$	-	-	V
Logic Output Low	$V_{\text{OL}}$	$I_{\text{OUT}} = 2 \text{ mA}$	-	-	0.45	V
Clock Duty Cycle		-	40	-	60	%

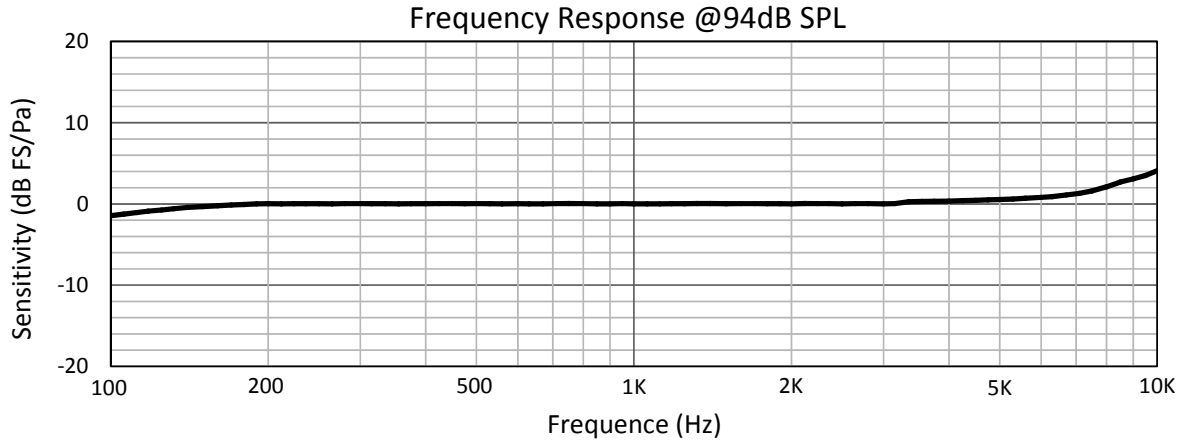


### MICROPHONE STATE DIAGRAM

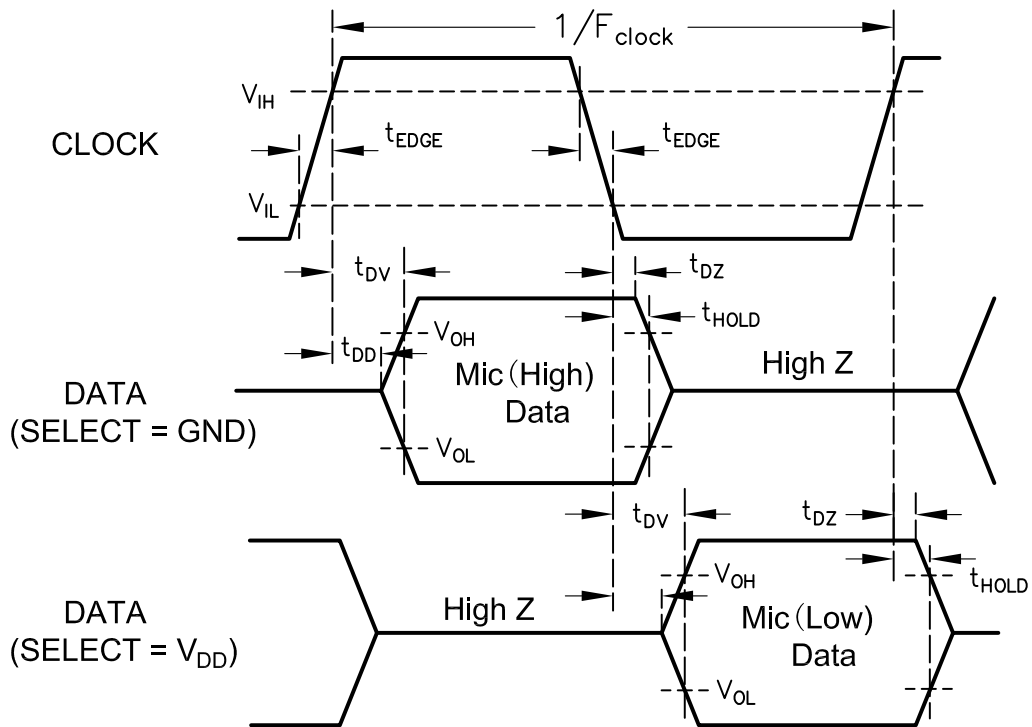




### TYPICAL FREQUENCY RESPONSE



### TIMING DIAGRAM



Parameter	Symbol	Min	Typ	Max
Clock Rise/Fall Time	$t_{EDGE}$	-	-	13ns
Delay Time to High Z	$t_{DZ}$	3ns	-	16ns
Delay Time to Data Line Driven	$t_{DD}$	18ns	28ns	40ns

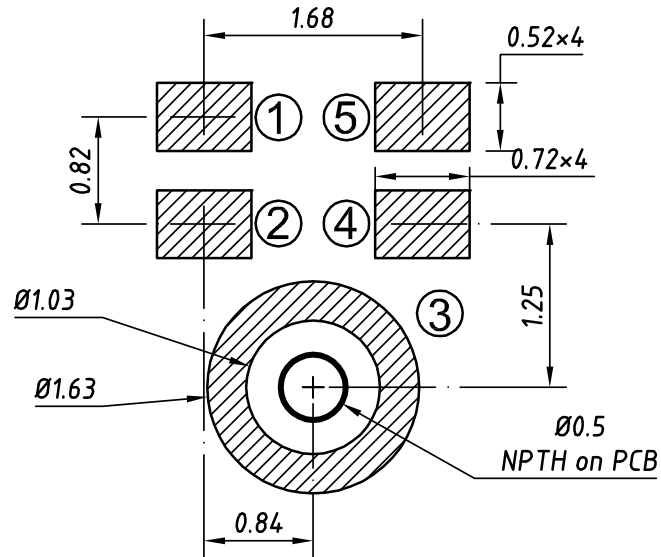
※  $t_{HOLD}$  and  $t_{DV}$  are related to load.



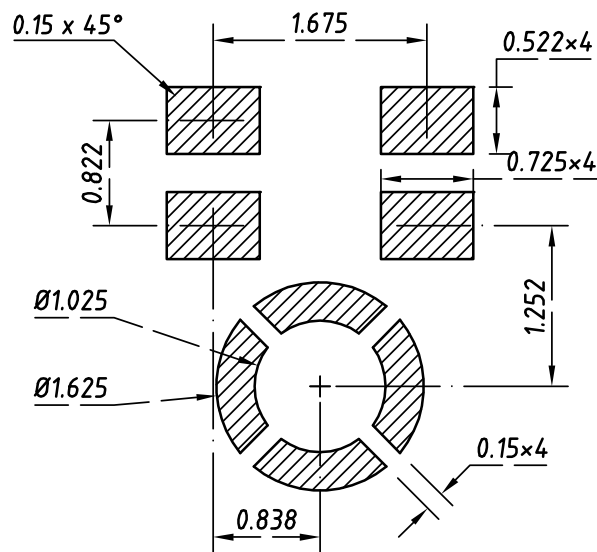


**SMT Parameters:**

**1. Recommend PCB land pattern layout: (unit: mm)**



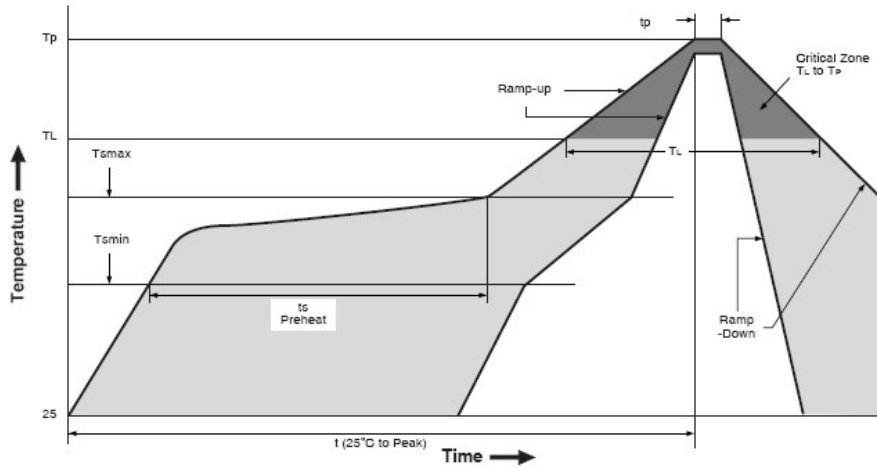
**2. Recommend stencil pattern: (unit: mm)**







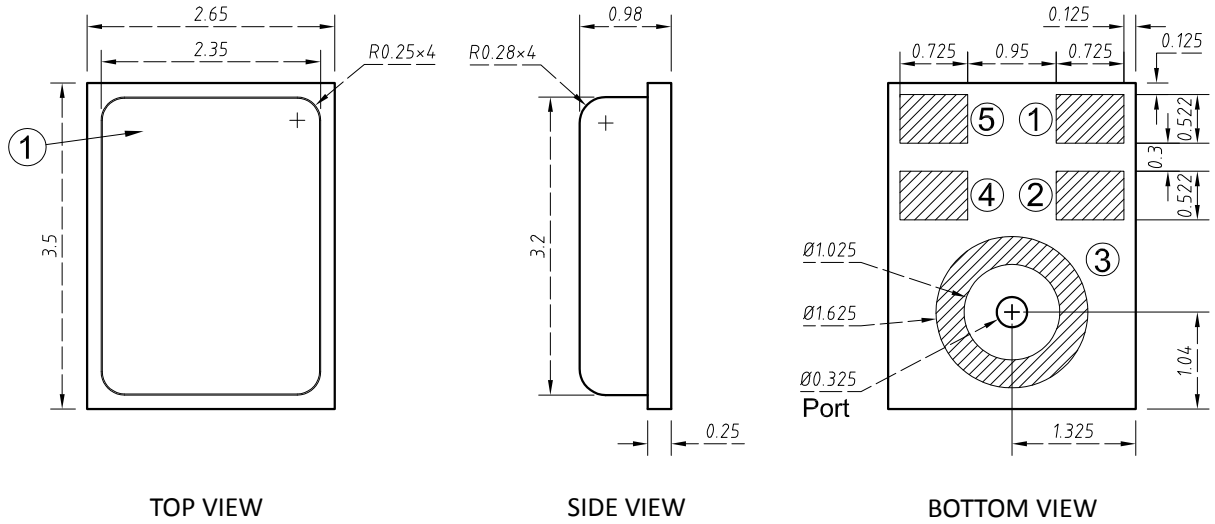
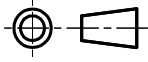
3. Recommend reflow profile:



Description	Parameter	Pb free
Average ramp rate	$T_L$ to $T_P$	3 °C/sec max
Preheat		
Minimum temperature	$T_{SMIN}$	150 °C
Maximum temperature	$T_{SMAX}$	200 °C
Time( $T_{SMIN}$ to $T_{SMAX}$ )	$t_s$	60 sec to 120 sec
Ramp-up rate	$T_{SMAX}$ to $T_L$	1.25 °C/sec max
Time maintained above liquidus temperature	$t_L$	60 sec to 150 sec
Liquidus temperature	$T_L$	217 °C
Peak temperature	$T_P$	260 °C max
Time within 5°C of actual peak temperature	$t_p$	20 sec to 40 sec
Ramp-down rate	$T_L$ to $T_P$	6 °C/sec max
Time 25 °C ( $t_{25 °C}$ ) to peak temperature	$t$	8 minutes max



**OUTLINE DIMENSIONS AND PIN DEFINITION:**



**PIN function description**

PIN#	Function
1	DATA
2	L/R
3	GND
4	CLK
5	VDD

Item	Dimension	Tolerance
Length (L)	3.50	±0.10
Width (W)	2.65	±0.10
Height (H)	0.98	±0.10
Acoustic Port (AP)	∅0.325	±0.05

Dimensions are in millimeters  
Tolerance is ±0.15mm unless otherwise specified.

## MSM261D3526Z1A

PDM digital output MEMS microphone



### ADDITIONAL NOTES

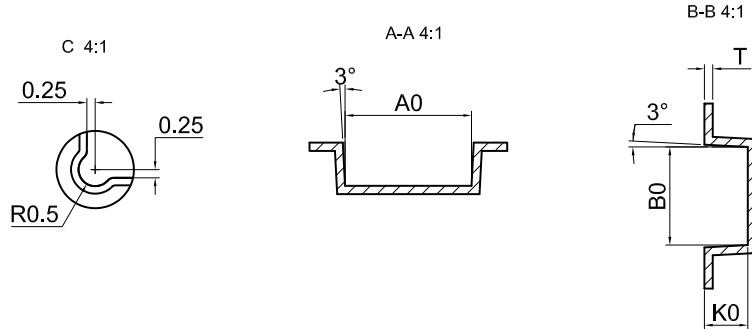
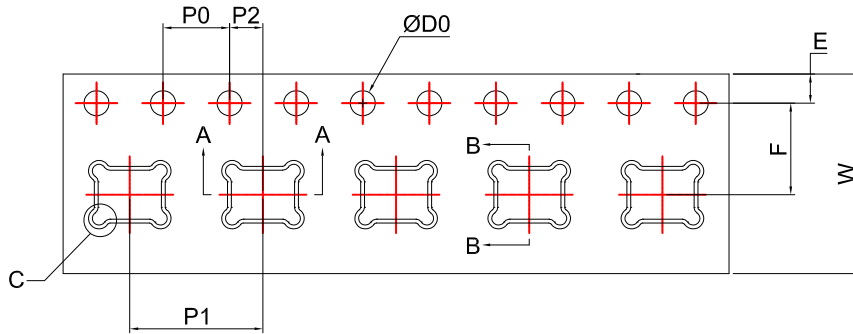
- (A) MSL (moisture sensitivity level) Class 2a.
- (B) Maximum of 3 reflow cycles is recommended.
- (C) In order to minimize device damage:
  - Do not board wash or clean after the reflow process.
  - Do not brush board with or without solvents after the reflow process.
  - Do not directly expose to ultrasonic processing, welding, or cleaning.
  - Do not insert any object in port hole of device at any time.
  - Do not apply air pressure into the port hole.
  - Do not pull a vacuum over port hole of the microphone.

### MATERIALS STATEMENT

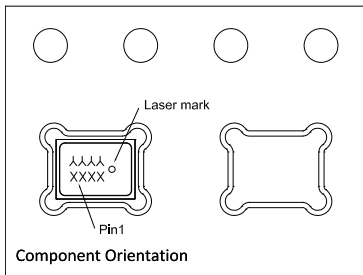
Meets the requirements of the European RoHS and Halogen-Free.



**PACKAGING & MARKING DETAIL:**



Direction of Feed →



ITEM	W	E	F	ØD0	K0
DIM(mm)	12.00±0.30	1.75±0.10	5.50±0.10	1.50 <sup>+0.10</sup> <sub>0</sub>	1.25±0.10
ITEM	P0	10P0	P1	A0	B0
DIM(mm)	4.00±0.10	40.00±0.20	8.00±0.10	3.80±0.10	2.95±0.10
ITEM	P2	T			
DIM(mm)	2.00±0.10	0.25±0.05			

**Note:**

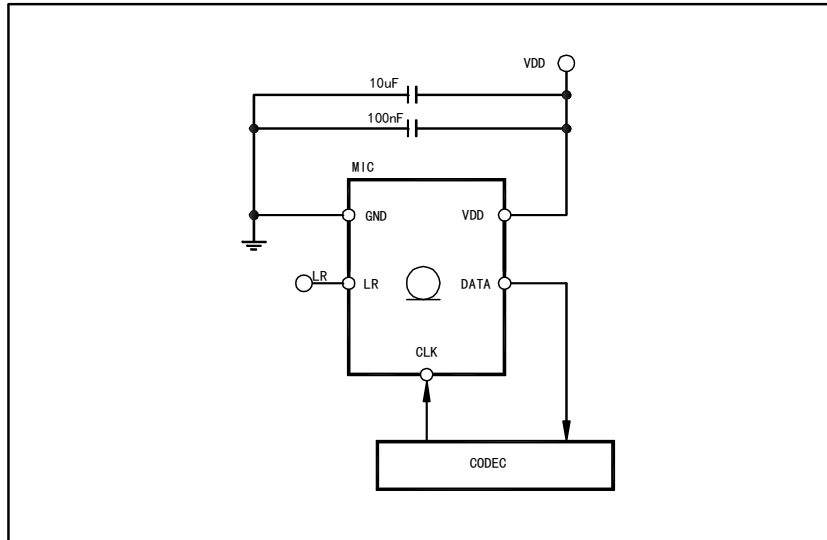
- 1) Dimensions are in mm;
- 2) Don't put the vacuum suction nozzle alignment the port hole;
- 3) Tape & Reel Per EIA-481 standard;
- 4) Label applied to external package and direct to reel;
- 5) Static voltage <100V;

Model Number	Reel Diameter	Quantity Per Reel
MSM261D3526Z1A	13 inch	5700

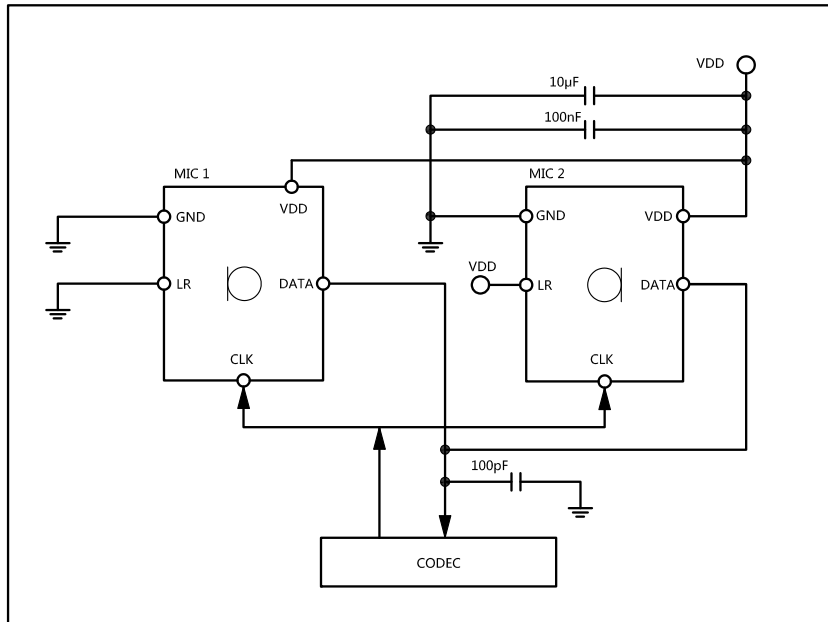


**RECOMMENDED INTERFACE CIRCUIT:**

**Figure 1. MSM261D3526Z1A electrical connections**



**Figure 2. Electrical connections for stereo configurations**



Power supply decoupling capacitors (100nF ceramic, 10uF ceramic) should be placed as near as possible to VDD of the device. (common design practice)



## RELIABILITY SPECIFICATIONS

Test	Description
Thermal Shock	100 cycles air-to-air thermal shock from -40°C to +125°C with 15 minute soaks. (IEC 68-2-4)
High Temperature Storage	1,000 hours at +105°C environment (IEC 68-2-2 Test Ba)
Low Temperature Storage	1,000 hours at -40°C environment (IEC 68-2-2 Test Aa)
Reflow	5 reflow cycles with peak temperature of +260°C
ESD-HBM/LID-GND	3 discharges of ±2 kV direct contact to I/O pins. (MIL 883E, Method 3015.7)& 3 discharges of ±8 kV direct contact to lid while unit is grounded. (IEC 61000-4-2)
Vibration	4 cycles of 20 to 2,000 Hz sinusoidal sweep with 20 G peak acceleration lasting 12 minutes in X, Y and Z directions. (Mil-Std-883E, Method 2007.2 A)
Mechanical Shock	3 pulses of 3,000 G in the X, Y and Z direction (IEC 68-2-27, Test Ea)
High Temperature Bias	1,000 hours at +105°C under bias (IEC 68-2-2 Test Ba)
Low Temperature Bias	1,000 hours at -40°C under bias (IEC 68-2-2 Test Aa)
Temperature/Humidity Bias	1,000 hours at +85°C/85% R.H. under bias. (JESD22-A101A-B)
Drop Test	To be no interference in operation after dropped to 1.0cm steel plate 18 times from 1.5 meter height

**NOTE:** Sensitivity should vary within ±3dB from initial sensitivity. (The measurement to be done after 2 hours of conditioning at 20±2°C, R.H 60%~70%)

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**REVISION HISTORY:**

Revision	Subjects (major changes since last revision)	Date
1.0	Initial Release	2016-10-28
1.1	Modified the Timing diagram	2017-1-16
1.2	Modified the Interface Circuit	2017-07-11
1.3	Update packaging detail	2017-10-11

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