

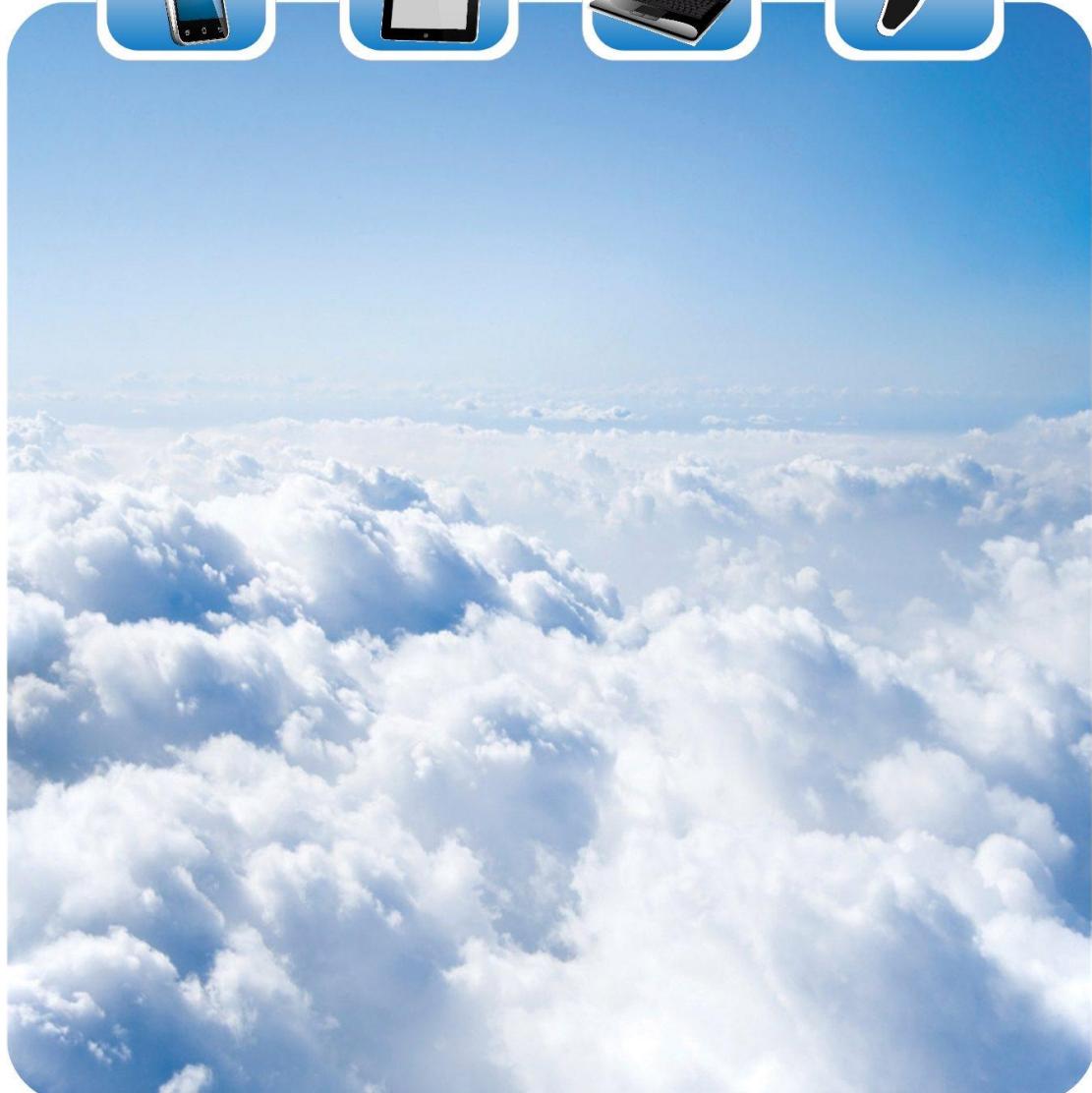


# Data Sheet

V 1.1 / Jul. 2022

MSM261DHT006

PDM digital output MEMS microphone with Multi-modes





## CONTENTS:

1. Title .....	1
2. Catalogue .....	2
3. General Description .....	3
4. Features .....	3
5. Applications .....	3
6. Product View.....	3
7. Absolute Maximum Ratings .....	4
8. Acoustic & Electrical Specifications.....	4
9. Microphone Interface Specifications.....	6
10. Microphone State Diagram .....	7
11. Typical Frequency Response .....	8
12. Timing Diagram.....	8
13. Outline Dimensions & Pin Definition .....	9
14. Reliability Specifications .....	10
15. Packaging & Marking Detail .....	11
16. Recommend Reflow Profile .....	12
17. Recommended Interface Circuit .....	13
18. Additional Notes .....	14
19. Storage and Transportation .....	14
20. Materials Statement .....	14
21. Revision History .....	15

## MSM261DHT006

PDM digital output MEMS microphone



### GENERAL DESCRIPTION

MSM261DHT006 is an omnidirectional, Top-ported, PDM digital output MEMS microphone. It has high performance and reliability.

MSM261DHT006 is available in a thin 4 mm × 3 mm × 1.05 mm proprietary LGA package. It is SMT compatible with no sensitivity degradation.

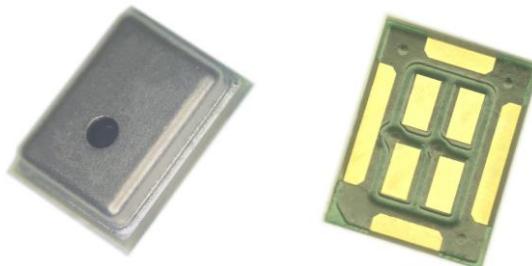
### APPLICATIONS

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

### FEATURES

- ✧ High SNR
- ✧ Fourth-order Σ-Δ 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





## ABSOLUTE MAXIMUM RATINGS

Parameter	Maximum value	Unit
Supply Voltage	-0.3 to 4.0	V
Sound Pressure Level	140	dB SPL
Storage temperature	-40 to 100	°C

## ACOUSTIC & ELECTRICAL SPECIFICATIONS

TEST CONDITIONS:  $25 \pm 10^\circ\text{C}$ ,  $50 \pm 20\%$  R.H.,  $\text{VDD}=1.8 \text{ V}$ ,  $f_{\text{CLOCK}}=2.4 \text{ MHz}$ , L/R pin grounded, no load, unless otherwise indicate

### General Microphone Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	$\text{V}_{\text{DD}}$		1.6	-	3.6	V
Clock Frequency Range	Sleep Mode		0		50	KHz
	Low-Power Mode		150		900	KHz
	Standard Performance Mode		1.1		4.8	MHz
Sleep Current	$I_{\text{SLEEP}}$	$f_{\text{CLOCK}} \leq 50 \text{ kHz}$	-	1		$\mu\text{A}$
DC Offset		Fullscale = $\pm 100$	-	4	-	% FS
Directivity			Omnidirectional			
Polarity		Increasing sound	increasing density of 1's			
Data Format			$\frac{1}{2}$ Cycle PDM			
Short Circuit Current	$I_{\text{SC}}$	Grounded DATA pin	1	-	10	mA
Output Load	$C_{\text{LOAD}}$		-	-	200	pF
Fall-asleep Time		$f_{\text{CLOCK}} \leq 50 \text{ kHz}$	-	-	30	$\mu\text{s}$
Wake-up Time		$f_{\text{CLOCK}} \geq 151 \text{ kHz}$	-	-	200	$\mu\text{s}$
Power-up Time		$\text{V}_{\text{DD}} \geq \text{V}(\text{min})$	-	6	20	ms
Mode-Change Time			-	-	10	ms



### Standard Performance Mode

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Current	$I_{DD}$	$f_{CLOCK}=2.4$ MHz	-	670	-	$\mu$ A
Sensitivity	S	94 dB SPL @ 1 kHz	-27	-26	-25	dBFS
Signal to Noise Ratio	SNR	20 kHz bandwidth, A-weighted $f_{CLOCK}=2.4$ MHz	-	60	-	dB(A)
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz, S = Typ	-	0.1	-	%
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = Typ	-	122	-	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	-	-80	-	dBFS (A)

**Low-Power Mode**TEST CONDITIONS:  $f_{CLOCK} = 768$  kHz,  $V_{DD} = 1.8$  V, unless otherwise indicated

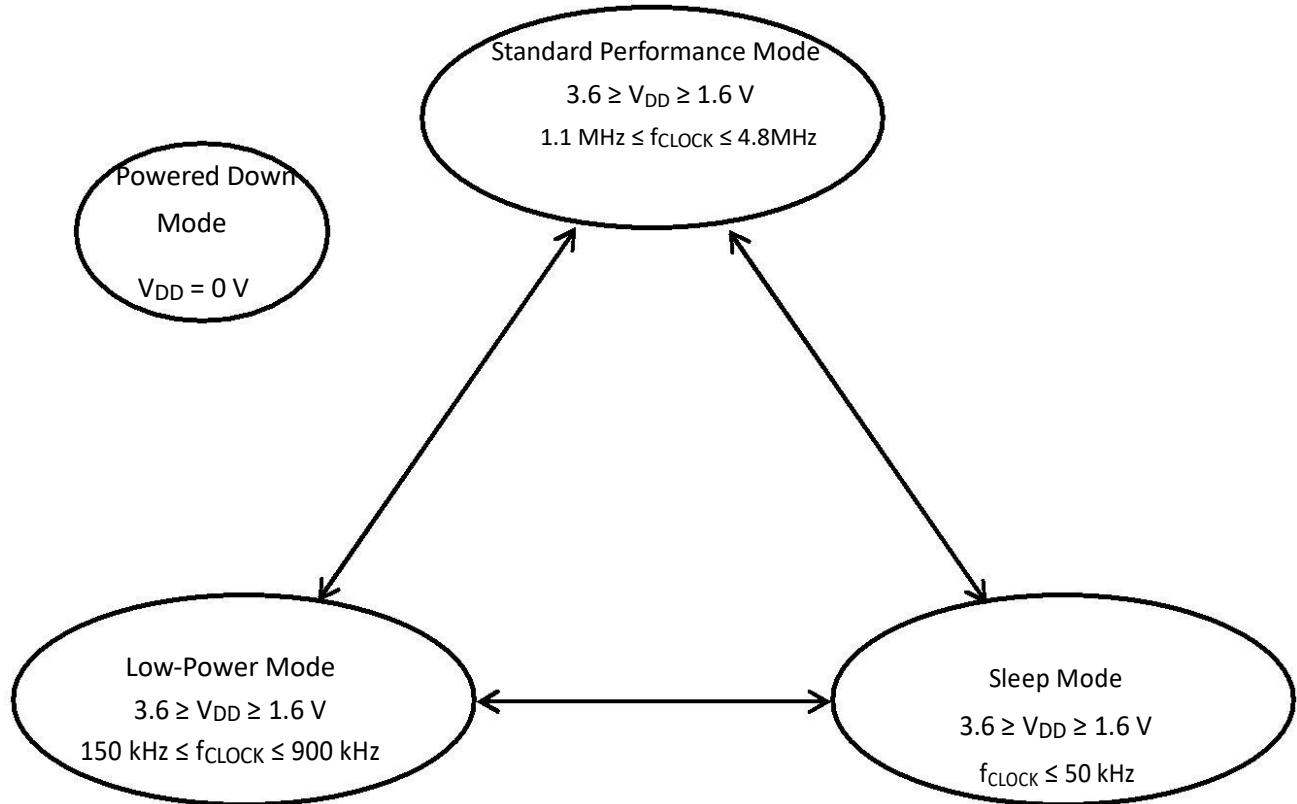
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Current	$I_{DD}$	$f_{CLOCK} = 768$ kHz	-	290	-	$\mu$ A
Sensitivity	S	94 dB SPL @ 1 kHz	-26	-25	-24	dBFS
Signal to Noise Ratio	SNR	94 dB SPL @ 1 kHz, A-weighted(20Hz-8KHz)	-	58	-	dB(A)
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz, S = Typ	-	0.1	-	%
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = Typ	-	122	-	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	$V_{IH}$		0.7X $V_{DD}$	-	3.6	V
Logic Input Low	$V_{IL}$		-0.3	-	0.3X $V_{DD}$	V
Logic Output High	$V_{OH}$	$I_{OUT} = 2$ mA	$V_{DD} - 0.45$	-	-	V
Logic Output Low	$V_{OL}$	$I_{OUT} = 2$ mA	-	-	0.45	V
Clock Duty Cycle		-	40	-	60	%

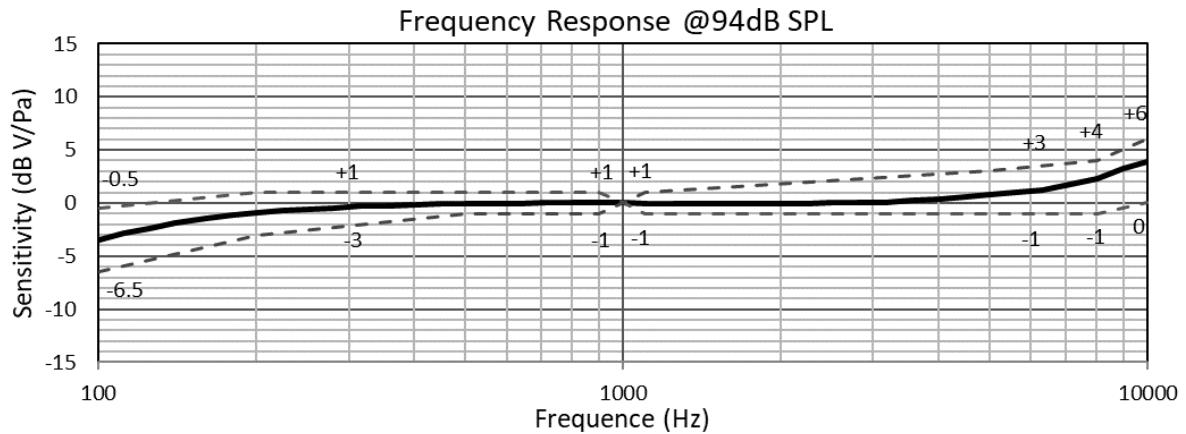


### MICROPHONE STATE DIAGRAM

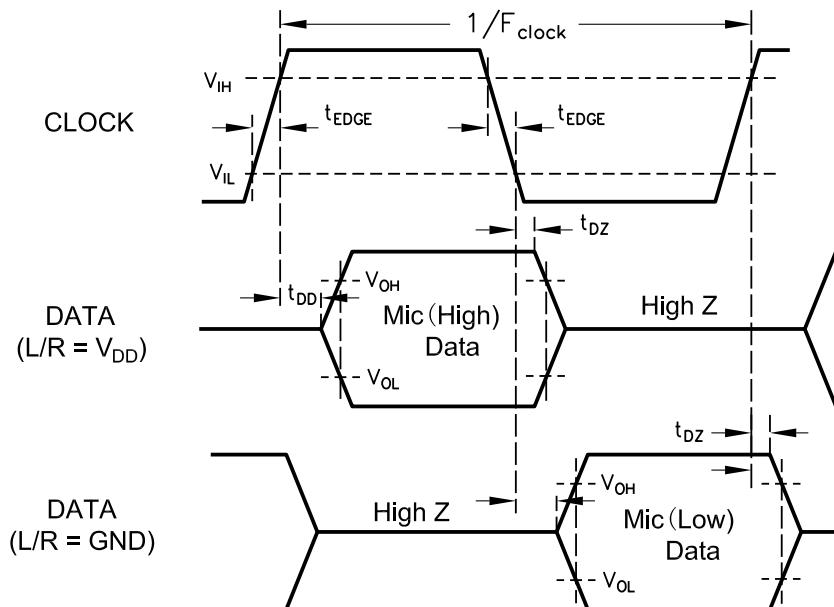




### TYPICAL FREQUENCY RESPONSE



### TIMING DIAGRAM

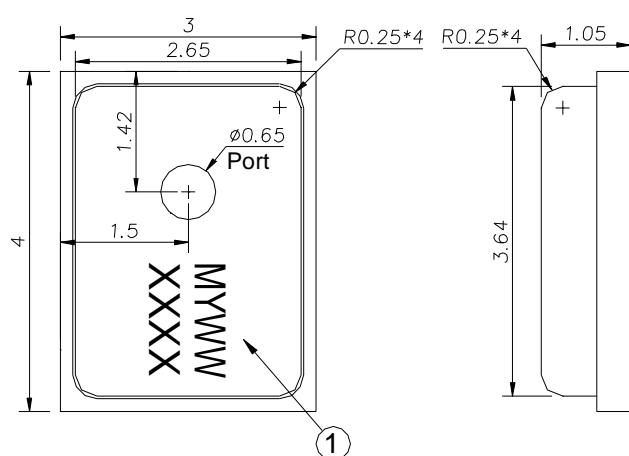
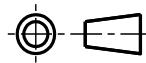


Parameter	Symbol	Min	Typ	Max
Clock Rise/Fall Time	$t_{EDGE}$	-	-	20ns
Delay Time to High Z	$t_{DZ}$	-	-	40ns
Delay Time to Data Line Driven	$t_{DD}$	-	-	50ns

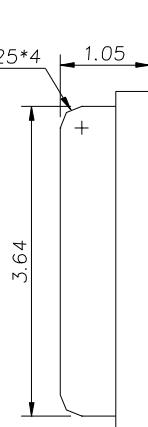
Microphone	L/R	Asserts DATA on	Latch DATA on
Mic(High)	Vdd	CLK rising edge	CLK falling edge
Mic(Low)	Ground	CLK falling edge	CLK rising edge



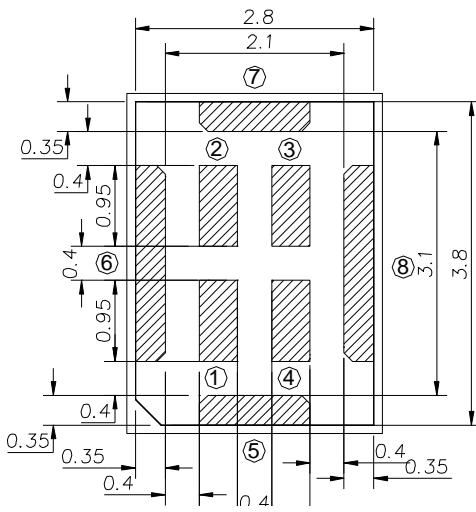
### OUTLINE DIMENSIONS AND PIN DEFINITION:



TOP VIEW



SIDE VIEW



BOTTOM VIEW

#### PIN function description

PIN#	Function
1	VDD
2	L/R
3	CLK
4	DATA
5,6,7,8	GND

Item	Dimension	Tolerance
Length (L)	4.00	±0.10
Width (W)	3.00	±0.10
Height (H)	1.05	±0.10
Port (AP)	Ø0.65	±0.05

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

MYWW XXXX	M	Memsensing
	Y	Year(A~Z)
	WW	Week
	XXXX	Serial Number



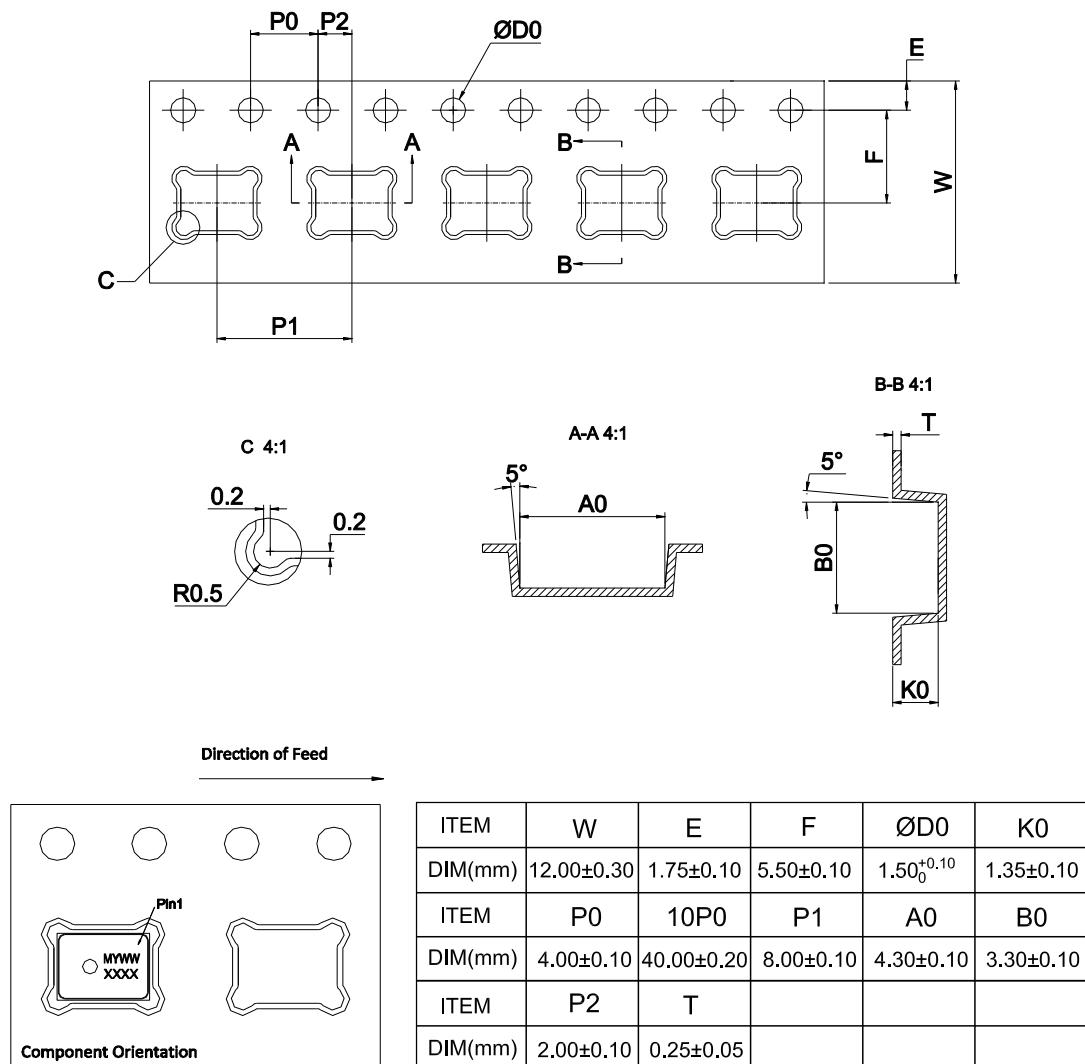
## RELIABILITY SPECIFICATIONS

Test	Description
Thermal Shock	100 cycles air-to-air thermal shock from -40°C to +125°C with 15 minute soaks. (IEC68-2-4)
High Temperature Storage	1,000 hours at +105°C environment. (IEC68-2-2 Test Ba)
Low Temperature Storage	1,000 hours at -40°C environment. (IEC68-2-2 Test Aa)
Reflow	5 reflow cycles with peak temperature of +260°C.
ESD-HBM	3 discharges of $\pm 2$ kV direct contact to I/O pins. (IEC 61000-4-2)
ESD-LID-GND	3 discharges of $\pm 8$ kV direct contact to lid while unit is grounded. (IEC 61000-4-2)
ESD-MM	3 discharges of $\pm 200$ V direct contact to I/O pins. (IEC STM5.2)
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 10,000 G in the X, Y and Z direction. (IEC68-2-27 Test Ea)
High Temperature Bias	1,000 hours at +105°C under bias (IEC68-2-2 Test Ba)
Low Temperature Bias	1,000 hours at -40°C under bias (IEC68-2-2 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  $\pm 3$  dB from initial sensitivity. (The measurement to be done after 2 hours of conditioning at  $25 \pm 10^\circ\text{C}$ ,  $50 \pm 20\%$  R.H.)



### PACKAGING & MARKING DETAIL:



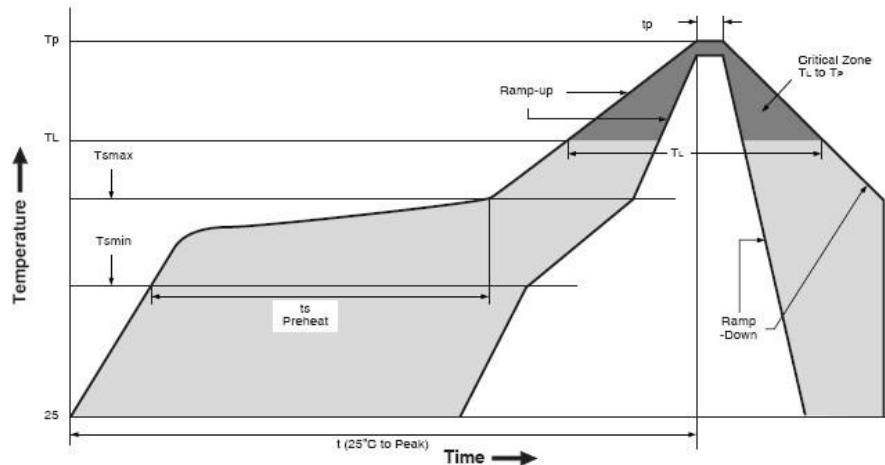
Note:

- 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
MSM261DHT006	13 inch	5700



### RECOMMEND REFLOW PROFILE:



Description	Parameter	Pb-free
Average ramp rate	$T_L$ to $T_p$	3 °C/sec max
Preheat		
Minimum temperature	$T_{S\text{MIN}}$	150 °C
Maximum temperature	$T_{S\text{MAX}}$	200 °C
Time( $T_{S\text{MIN}}$ to $T_{S\text{MAX}}$ )	$t_s$	60 sec to 180 sec
Ramp-up rate	$T_{S\text{MAX}}$ to $T_L$	1.5 ~ 2°C/sec
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

NOTE: When MEMS MIC is soldered on PCB, the reflow profile is set according to solder paste and the thickness of PCB etc.


**RECOMMENDED INTERFACE CIRCUIT:**

Figure 1. MSM261DHT006 electrical connections

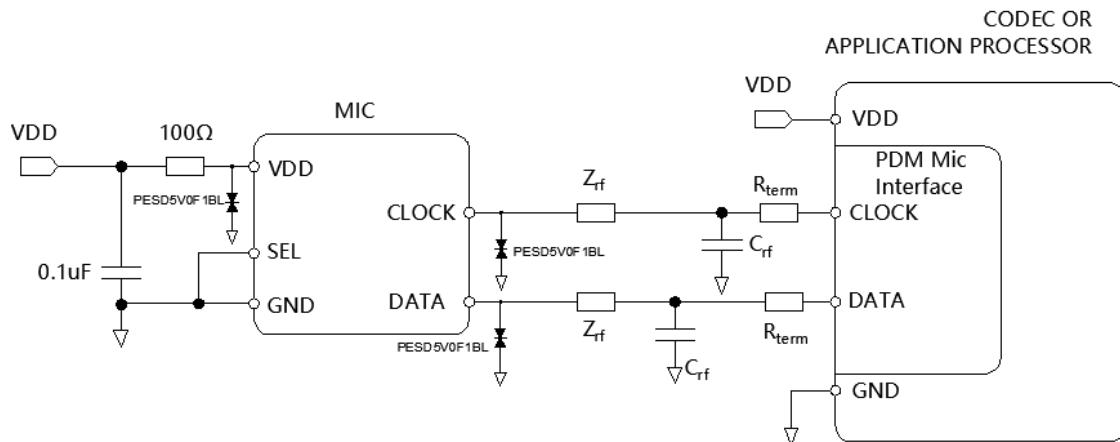
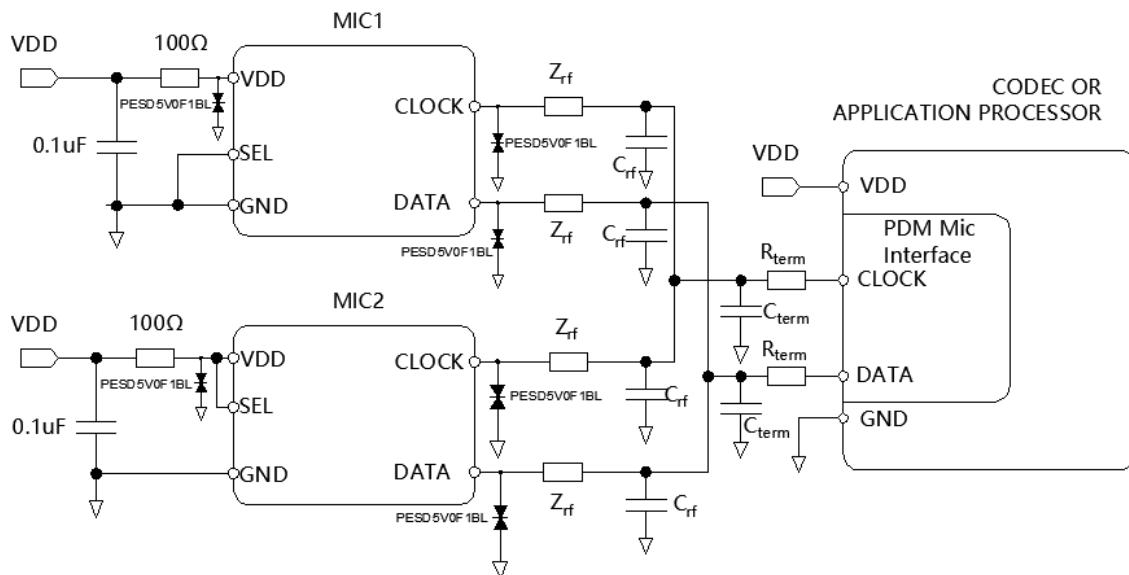


Figure 2. Electrical connections for stereo configurations



Power supply decoupling capacitors (0.1uF capacitor, 100Ω resistor and the TVS diode) should be placed as near as possible to VDD of the device. (common design practice)

Zrf, Crf, Zterm, and Cterm are all used for debugging. Actually their values or NC are based on the debugging result.



## 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 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.

## STORAGE AND TRANSPORTATION

(A) Keep MEMS MIC in warehouse with less than 75% humidity and without sudden temperature change, acid air, any other harmful air or strong magnetic field.

Recommend floor life (out of bag) at factory no more than 4 weeks.

(B) The MEMS MIC with normal pack can be transported by ordinary conveyances.

Please protect products against moist, shock, sunburn and pressure during transportation.

## MATERIALS STATEMENT

Meet the requirements of MEMSensing standard on hazard substances control (including RoHS2.0+REACH+Halogen-Free, etc.), with “HSF” identification on label.

# MSM261DHT006

PDM digital output MEMS microphone



## REVISION HISTORY:

Revision	Subjects (major changes since last revision)	Date
1.0	Initial Release	2022-07-13
1.1	Update the typical of SNR	2022-07-15

## 公司销售、技术支持联系方式

(<http://www.memsensing.com>)

For English:

*MEMSensing Microsystems(Suzhou,China)  
Co., Ltd.*

No. 99 Jinji Lake Avenue, Bldg. NW-09, Suite 501  
Suzhou Industrial Park, China 215123

Phone: +86 512 62956055  
Fax: +86 512 62956056

中文用户:

苏州敏芯微电子技术股份有限公司  
苏州工业园区金鸡湖大道 99 号, NW-09 楼, 501 室  
中国 215123  
电话: +86 512 62956055  
传真: +86 512 62956056

Disclaimer: specifications and characteristics are subject to change without notice. MEMSensing Microsystems Co., Ltd. assumes no liability to any customer, licensee or any third party for any damages or any kind of nature whatsoever related to using this technical data.