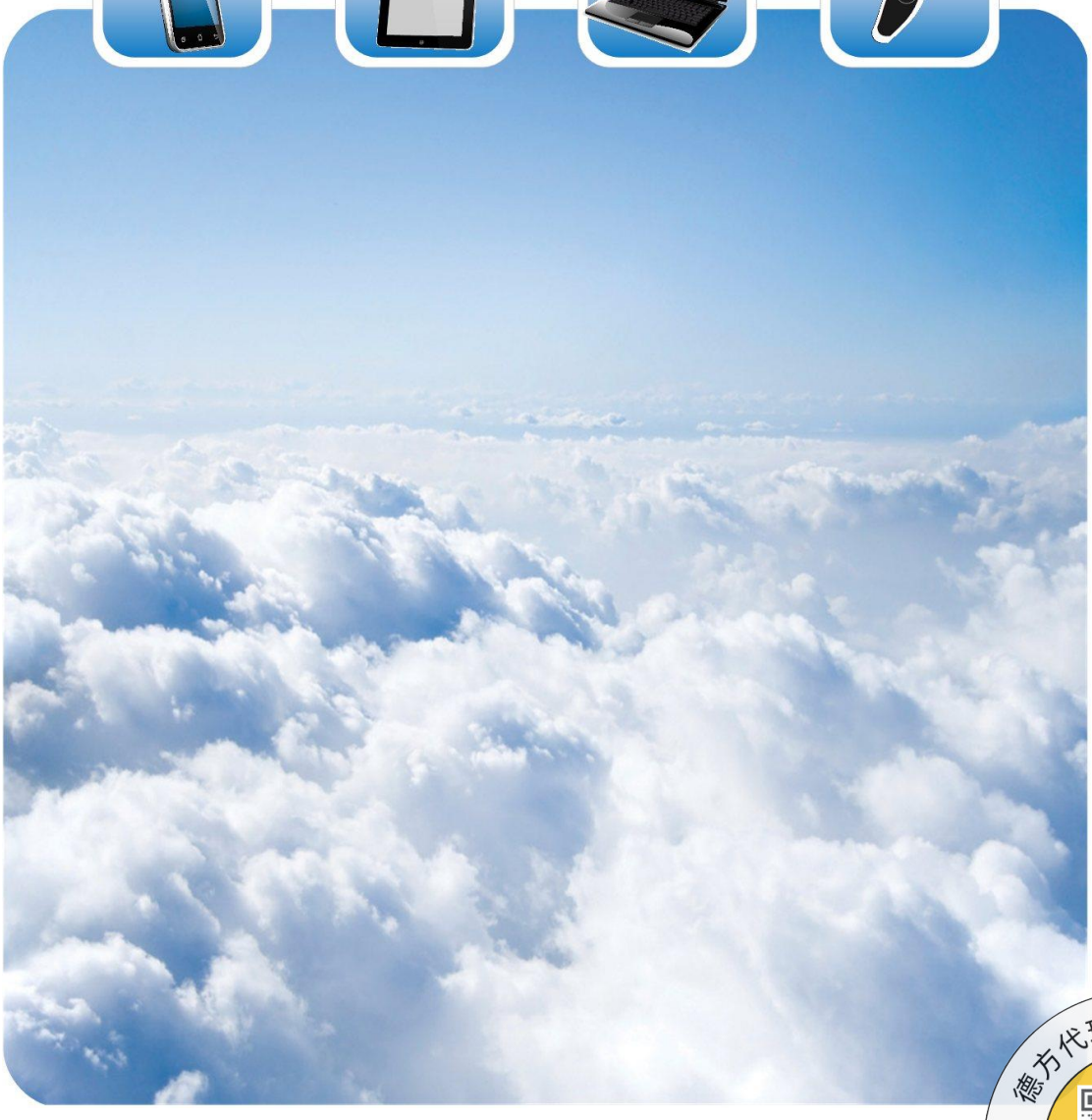
敏芯股份
MEMSensing

Data Sheet

V 1.1 / May. 2022

MSM381ACP003

Analog output MEMS microphone



MSM381ACP003

Analog output MEMS microphone

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MSM381ACP003

Analog output MEMS microphone

GENERAL DESCRIPTION

MSM381ACP003 is an omnidirectional, Top-ported, analog output MEMS microphone. It has high performance and reliability. It is with enhanced RF immunity performance .

MSM381ACP003 is available in a thin 2.75 mm × 1.85 mm × 1.00 mm LGA package. It is SMT compatible with no sensitivity degradation.

FEATURES

- ✧ High AOP
- ✧ Omnidirectional
- ✧ Excellent RF immunity
- ✧ Standard SMD Reflow
- ✧ Compatible with Sn/Pb and Pb-free solder processes
- ✧ RoHS/Halogen free compliant
- ✧ Sensitivity Matching within +/-1dB

APPLICATIONS

- ✧ For ANC
- ✧ Laptop
- ✧ Tablet computer
- ✧ Bluetooth headset
- ✧ Earphone
- ✧ Wearable intelligent equipment

PRODUCT VIEW

ABSOLUTE MAXIMUM RATINGS

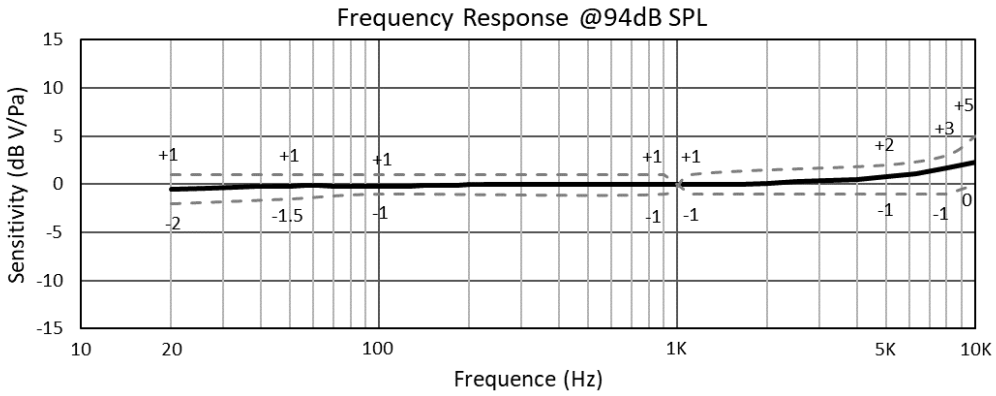
Parameter	Maximum value	Unit
Supply Voltage	−0.3 to 4.0	V
Sound Pressure Level	140	dB SPL
Storage temperature	−40 to 100	°C

Stresses exceeding these “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation at these or any other conditions beyond those indicated under “Acoustic & Electrical Specifications” is not implied. Exposure beyond those indicated under “Acoustic & Electrical Specifications” for extended periods may affect device reliability.

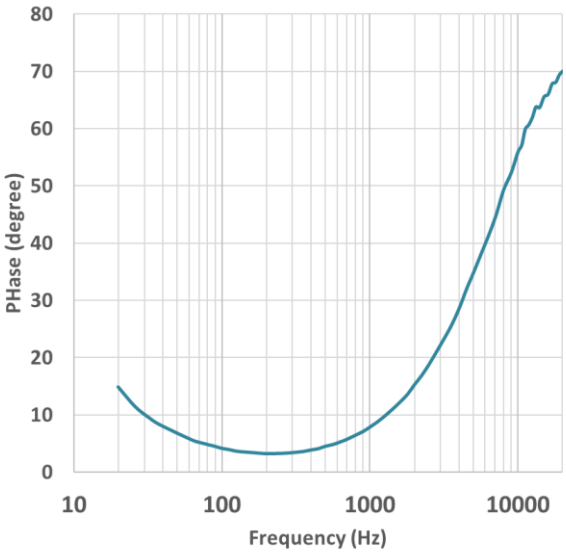
ACOUSTIC & ELECTRICAL SPECIFICATIONS

All data taken @1.8V, 25±10°C, RH 50±20% ,unless otherwise specified					
	Limits			**unit**	**condition**
	Min.	Nom.	Max.		
Directivity		Omni directional			
Sensitivity	-39	-38	-37	dB	@1kHz ref 1V/Pa
Operation voltage	1.5	-	3.6	V	
Freq. range		Refer to the frequency response graphic		Hz	Ref to sensitivity@1kHz
Sensitivity loss across supply voltage		No change across the voltage range		dB	
Signal to noise ratio	-	64	-	dB	94dB SPL @1kHz, A-weighted
THD	-	0.1	-	%	94dB SPL @1kHz S =Nom, Rload > 2 k
AOP	127	130	-	dB SPL	10% THD @1kHz S =Nom, Rload > 2 k
Polarity		Increasing output voltage			Increasing sound pressure
Output impedance	-	170	-	Ω	@1kHz
DC Output		0.75		V	
PSRR	-	65	-	dB	200mVpp sine wave @ 1 kHz, V_{DD} = 1.8V
PSR	-	-90	-	dBV(A)	100 mVpp square wave@ 217 Hz, V_{DD} = 1.8V, A-weighted
Current consumption	-	175	-	μA	

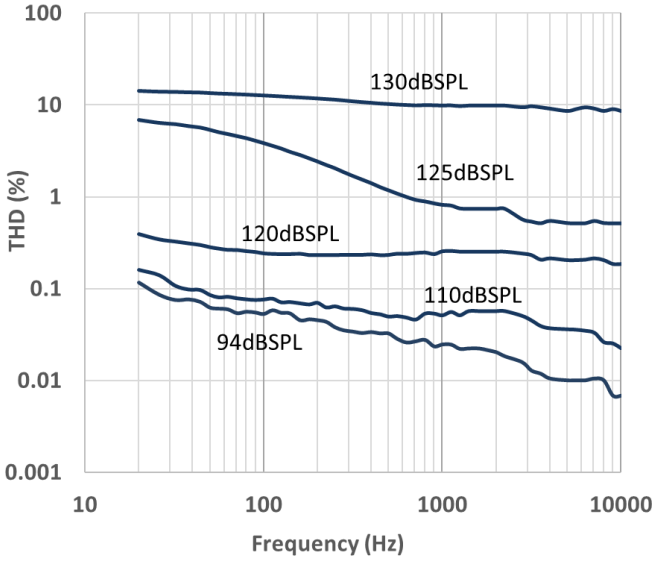
TYPICAL FREQUENCY RESPONSE



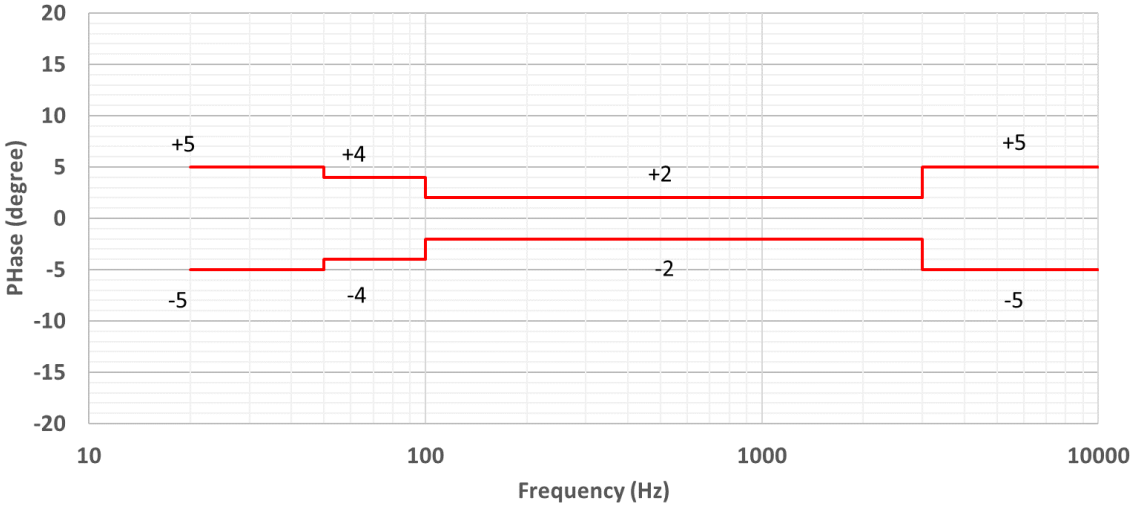
Phase vs Frequency



THD vs Frequency

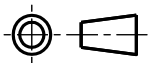


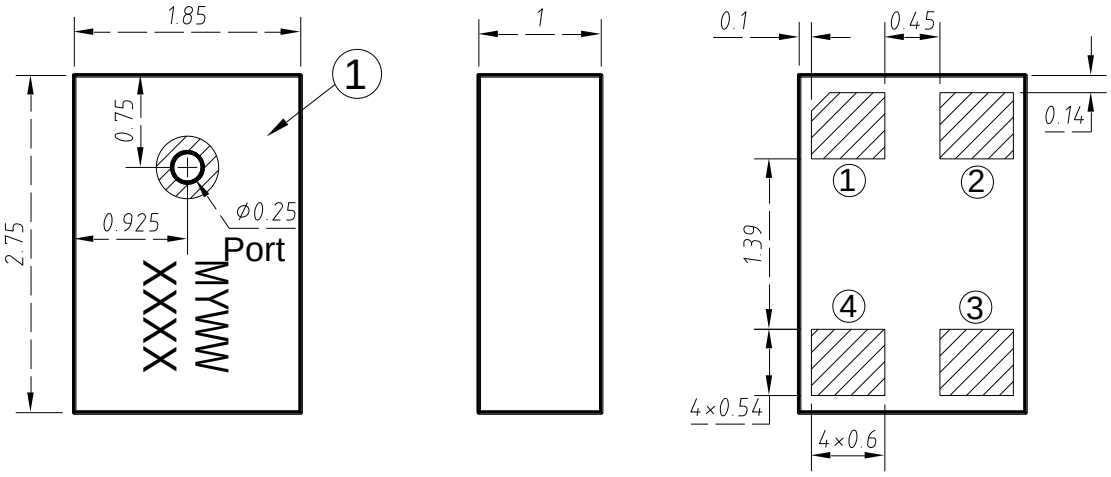
PHASE LIMIT



	20~50Hz	50 ~ 100Hz	100 ~ 3k Hz	3k ~ 10k Hz
Max	+5°	+4°	+2°	+5°
Min	-5°	-4°	-2°	-5°

OUTLINE DIMENSIONS AND PIN DEFINITION：





TOP VIEW　　SIDE VIEW　　BOTTOM VIEW

PIN function description

PIN#	Function
1	VDD
2	OUT
3	GND
4	GND

Item	Dimension	Tolerance
Length (L)	2.75	±0.10
Width (W)	1.85	±0.10
Height (H)	1.00	±0.10
Acoustic Port (AP)	Ø0.25	±0.05

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

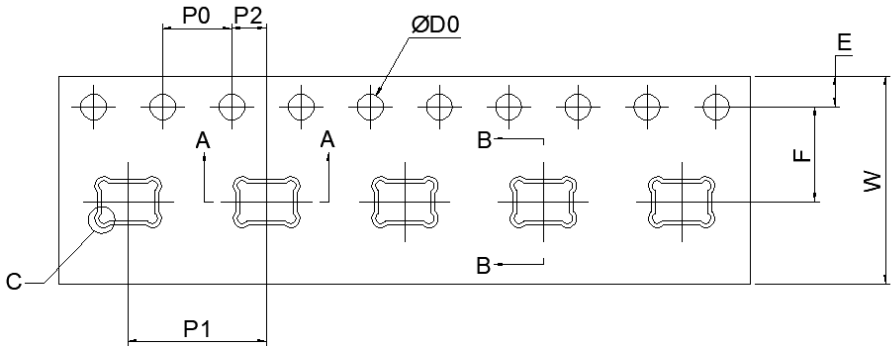
MYWW XXXX	M	Memsensing
	Y	Year(A~Z)
	WW	Week
	XXXX	Serial Number

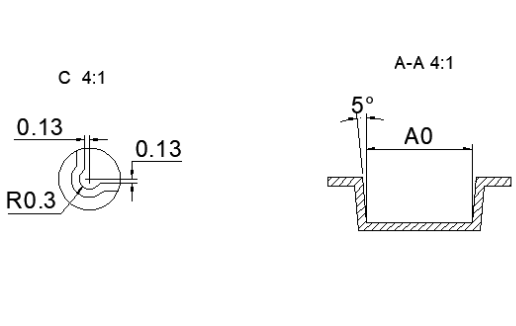
RELIABILITY SPECIFICATIONS

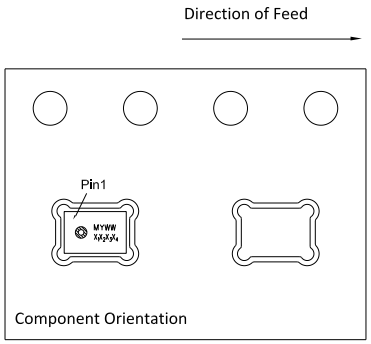
Test	Description
Thermal Shock	100 cycles air-to-air thermal shock from -40°C to +125°C with 15 minute soaks. (IEC68-2-4)
High Temperature Storage	1,000 hours at +105°C environment. (IEC68-2-2 Test Ba)
Low Temperature Storage	1,000 hours at -40°C environment. (IEC68-2-2 Test Aa)
Reflow	5 reflow cycles with peak temperature of +260°C.
ESD-HBM	3 discharges of ±2 kV direct contact to I/O pins. (IEC 61000-4-2)
ESD- LID-GND	3 discharges of ±8 kV direct contact to lid while unit is grounded. (IEC 61000-4-2)
ESD-MM	3 discharges of±200V 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 ±3dB from initial sensitivity. (The measurement to be done after 2 hours of conditioning at 25 ±10°C, 50±20% R.H.)

PACKAGING & MARKING DETAIL:







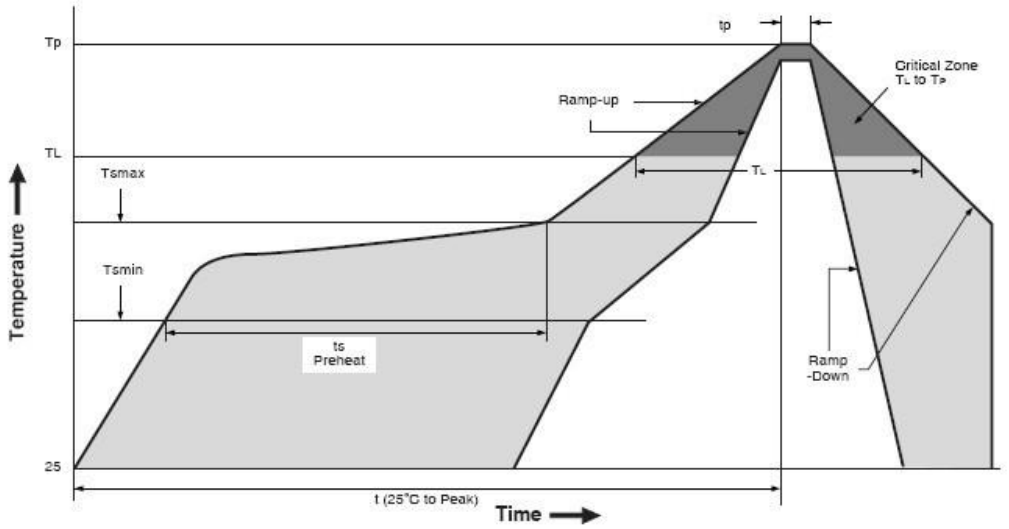
ITEM	W	E	F	ØD0	K0
DIM(mm)	12.00±0.30	1.75±0.10	5.50±0.10	$1.50^{+0.10}_{0}$	1.15±0.10
ITEM	P0	10P0	P1	A0	B0
DIM(mm)	4.00±0.10	40.00±0.20	8.00±0.10	3.05±0.10	2.15±0.10
ITEM	P2	T			
DIM(mm)	2.00±0.10	0.25±0.05			

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 directly on reel;
5) Static voltage <100V;

Model Number	Reel Diameter	Quantity Per Reel
MSM381ACP003	13 inch	5700

RECOMMEND REFLOW PROFILE:

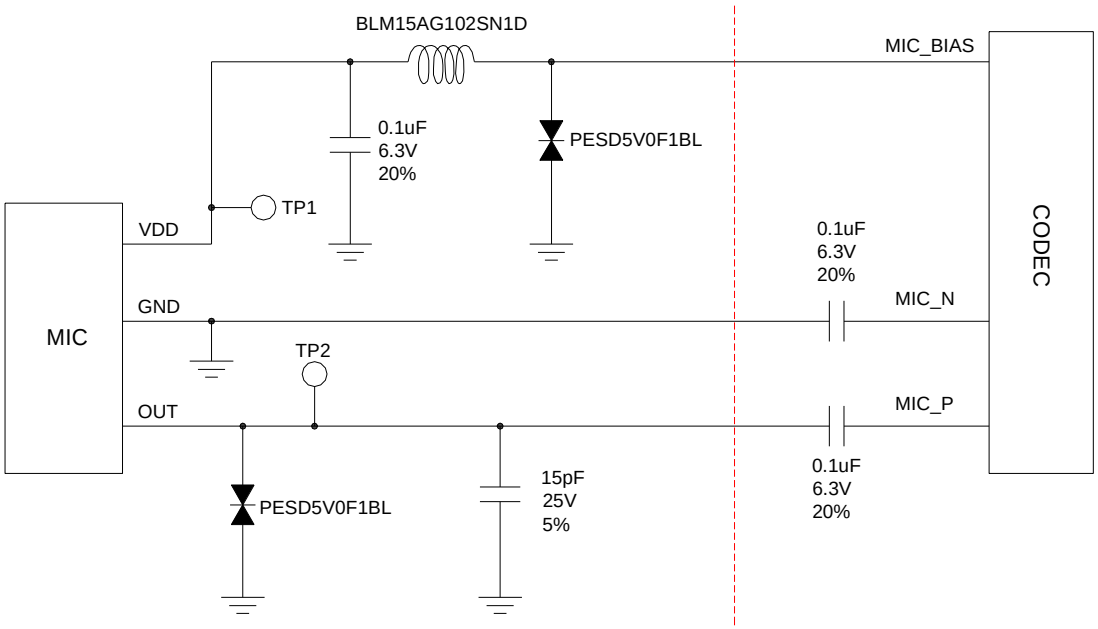


Description	Parameter	Pb-free
Average ramp-up rate	$T_{smax}$to T_P	3°C/sec max
Preheat		
Minimum temperature	T_{SMIN}	150 °C
Maximum temperature	T_{SMAX}	200 °C
Time(T_{SMIN} to T_{SMAX})	t_S	60 sec to 180 sec
Ramp-up rate	T_{SMAX} to T_L	1.5 ~ 2°C/sec
Time maintained above liquidus temperature	t_L	60 sec to 150 sec
Liquidus temperature	T_L	217 °C
Peak temperature	T_P	260 °C
Time within 5°C of actual peak temperature	t_P	20 sec to 40 sec
Ramp-down rate	T_P to T_{smax}	6 °C/sec max
Time 25 °C (t25 °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：

- **Recommended Application Example (differential amplification circuit)**



NOTE：It is recommended that the components on the left side of red line be placed close to MIC， and components on the right side of red line be placed close to codec.

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.

REVISION HISTORY:

Revision	Subjects (major changes since last revision)	Date
1.0	Initial Release	2022-01-05
1.1	Update Acoustic Specifications	2022-05-05

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