

SPECIFICATION

受控

Customer:

Product Name: MEMS

Model : KPCM- 1878LR5H 44DB-A

Drawing No.: 308-0302-00019

Compliance with ROHS (本品符合 ROHS 指令)

--

Signature of KEPO

Issued by	Checked by	Approved by	Date



宁波凯普电子有限公司

Ningbo Kepo Electronics Co., Ltd.

宁波东钱湖镇东钱湖工业区宝源路 25 号

TEL:+86-574-88370330

FAX:+86-574-88370329

ADD: No.25 Baoyuan road, Dongqian Lake Industry Area, Dongqian town, Ningbo City, China

Post Code: 315121

Email: Sales@chinaacoustic.com

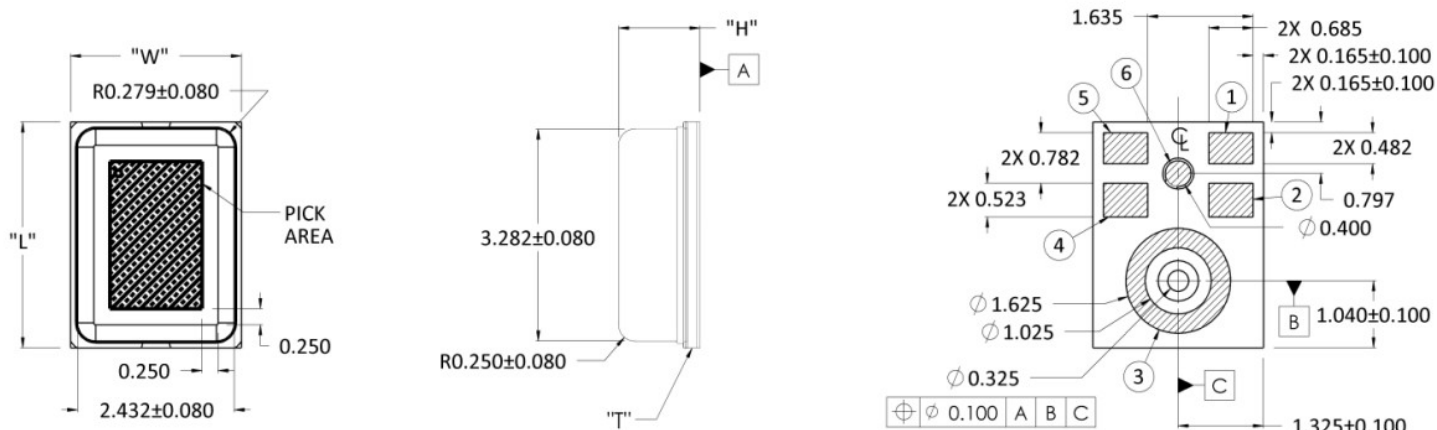
<http://www.KepoTech.com>

CONTENTS 目录

1. Mechanical Layout and Dimensions-----	3
机械布局与尺寸	
2. Electrical and Acoustic Characteristics.-----	5
电声参数	
3. Mechanical characteristics and environmental test-----	7
机械特性和环境试验	
4. Packaging Specifications-----	8
包装规格	
5. Solder Reflow Profile-----	10
回流焊条件	
6. Additional Notes-----	11
注意事项	
7. Storage And Transportation-----	11
存储与运输	
8. REVISION HISTORY-----	12
履历	

1. Mechanical Layout and Dimensions 机械布局与尺寸

1.1 Dimensions 尺寸



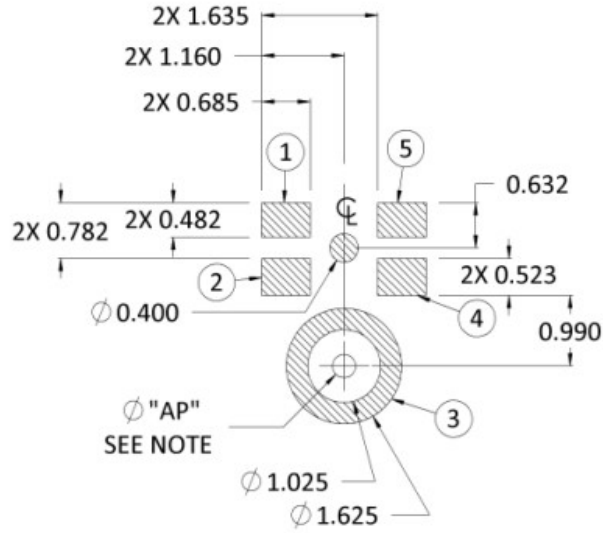
Item	Dimension	Tolerance
Length (L)	3.5	± 0.10
Width (W)	2.65	± 0.10
Height (H)	1.26	± 0.10
Acoustic Port	$\phi 0.325$	± 0.05

Pin #	Pin Name	Type	Description
1	DATA	Signal	Output
2	GROUND	Power	Ground
3	GROUND	Power	Ground
4	GROUND	Power	Ground
5	Vdd	Power	Power Supply
6	OUT(-)	Signal	Output

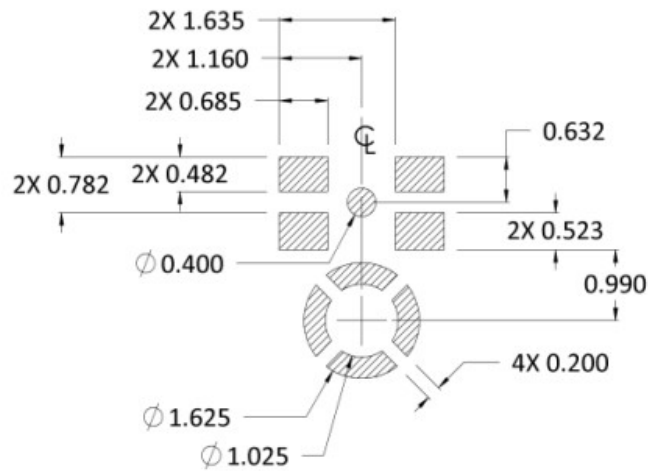
□ Notes: Pick Area only extends to 0.25 mm of any edge or hole unless otherwise specified. Dimensions are in millimeters unless otherwise specified. Tolerance is ± 0.15 mm unless otherwise specified.
 除非另有规定，否则拾取区域仅延伸到任何边或孔的0.25 mm。除非另有规定，否则尺寸单位为毫米。
 除非另有规定，否则公差为 ± 0.15 mm

1.2 Recommended Customer Land Pattern & stencil pattern layout:
推荐客户布线

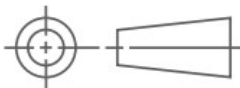
Example Land Pattern



Example Solder Stencil Pattern

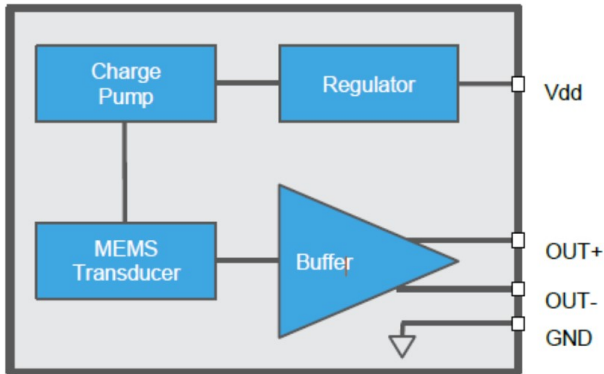


NOTES:



- Pick Area only extends to 0.25 mm of any edge or hole unless otherwise specified.
- Dimensions are in millimeters unless otherwise specified.
- Tolerance is ± 0.15 mm unless otherwise specified.
- In the acoustic path, and . Further optimizations based on application should be performed.

2. Electrical and Acoustic Characteristics.电声参数



2.1 ACOUSTIC & ELECTRICAL SPECIFICATIONS

Table 1: Absolute Maximum Ratings

Parameter	Absolute Maximum Rating	Units
Vdd to Ground	-0.5, +5.0	V
OUT+, OUT- to Ground	-0.3, Vdd+0.3	V
Input Current	±5	mA
Storage Temperature	-40 to +125	°C
Operating Temperature	-40 to +85	°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.

Table 2: Normal Mode (NM) Microphone Specifications¹Test Conditions: 23 ±2°C, 55±20% R.H., V_{dd}=2.75V, no load, unless otherwise indicated

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	V _{dd}		2.3	2.75	3.6	V
Supply Current	I _{dd}	V _{dd} = 2.75 V	-	250	-	µA
Sensitivity	S	94 dB SPL @ 1kHz, Single-Ended	-45	-44	-43	dBV/Pa
		94 dB SPL @ 1kHz, Differential	-39	-38	-37	
Signal to Noise Ratio	SNR	94 dB SPL @ 1kHz, A-weighted, Single-Ended Mode	-	66	-	dB(A)
		94 dB SPL @ 1kHz, A-weighted, Differential Mode	-	66	-	
Near-Ultrasonic SNR		94 dB SPL, @ 19 kHz, BW = 18.5 - 20.0 kHz	-	TBD	-	dB
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz	-	0.05	-	%
		115 dB SPL @ 1 kHz	-	0.1	-	%
		1% THD @ 1 kHz, S = typ	-	125	-	dB SPL
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = typ	-	134	-	dB SPL
Low Frequency Rolloff	LFRO	-3dB relative to 1 kHz	-	6.5	-	Hz
High Frequency Flatness		+3dB relative to 1 kHz	-	TBD	-	kHz
Resonant Frequency Peak	F _{res}		-	TBD	-	kHz
Power Supply Rejection Ratio	PSRR	200 mVpp sinewave @ 1 kHz, Single-Ended Mode	-	64	-	dB
		200 mVpp sinewave @ 1 kHz, Differential Mode	-	82	-	
Power Supply Rejection	PSR+N	200 mVpp 7/8 duty cycle rectangular waveform @ 217 Hz, A-weighted, BW = 20 kHz, Single-Ended	-	-90	-	dBV(A)
		200 mVpp 7/8 duty cycle rectangular waveform @ 217 Hz, A-weighted, BW = 20 kHz, Differential	-	-101	-	
DC Output		V _{dd} = 2.75V	-	0.69	-	V
DC Offset		OUT+ to OUT-	-	-	±20	mV
Output Impedance	Z _{out}	@ 1 kHz	-	380	-	Ω
Output Load	C _{load}		-	-	-	pF
	R _{load}	AC-coupled	10	-	-	kΩ
Sensitivity Drop		V _{dd} (min) ≤ V _{dd} ≤ V _{dd} (max)	-	-	±0.25	dB
Directivity			Omnidirectional			
Polarity		Increasing sound pressure	Increasing Output Voltage			
Startup Time		S within TBD dB of final value, outputs AC coupled	-	-	15	ms

¹ Sensitivity and Supply Current are 100% tested.

Table 3: Low Power Mode (LPM) Microphone Specifications¹

Test Conditions: 23 ±2°C, 55±20% R.H., Vdd=1.8V, no load, unless otherwise indicated

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	Vdd		1.6	1.8	1.9	V
Supply Current	Idd	Vdd=1.8V	-	100	-	µA
Sensitivity	S	94 dB SPL @ 1kHz, Single-Ended	-45	-44	-43	dBV/Pa
		94 dB SPL @ 1kHz, Differential	-39	-38	-37	
Signal to Noise Ratio	SNR	94 dB SPL @ 1kHz, A-weighted, Single-Ended Mode	-	65	-	dB(A)
		94 dB SPL @ 1kHz, A-weighted, Differential Mode	-	64	-	
Near-Ultrasonic SNR		94 dB SPL, @ 19 kHz, BW = 18.5 - 20.0 kHz	-	TBD	-	dB
Total Harmonic Distortion	THD	94 dB SPL @ 1 kHz	-	0.05	-	%
		115 dB SPL @ 1 kHz	-	0.1	-	%
		1% THD @ 1 kHz, S = typ	-	125	-	dB SPL
Acoustic Overload Point	AOP	10% THD @ 1 kHz, S = typ	-	132	-	dB SPL
Low Frequency Rolloff	LFRO	-3dB relative to 1 kHz	-	6.5	-	Hz
High Frequency Flatness		+3dB relative to 1 kHz	-	TBD	-	kHz
Resonant Frequency Peak	Fres		-	TBD	-	kHz
Power Supply Rejection Ratio	PSRR	200 mVpp sinewave @ 1 kHz, Single-Ended Mode	-	77	-	dB
		200 mVpp sinewave @ 1 kHz, Differential Mode	-	64	-	
Power Supply Rejection	PSR+N	200 mVpp 7/8 duty cycle rectangular waveform @ 217 Hz, A-weighted, BW = 20 kHz, Single-Ended	-	-98	-	dBV(A)
		200 mVpp 7/8 duty cycle rectangular waveform @ 217 Hz, A-weighted, BW = 20 kHz, Differential	-	-88	-	
DC Output		Vdd= 1.8V	-	0.69	-	V
DC Offset		OUT+ to OUT-	-	-	±20	mV
Output Impedance	Zout	@ 1 kHz	-	380	-	Ω
Output Load	Cload		-	-	-	pF
	Rload	AC-coupled	10	-	-	kΩ
Sensitivity Drop		Vdd(min) ≤ Vdd ≤ Vdd(max)	-	-	±0.25	dB
Directivity			Omnidirectional			
Polarity		Increasing sound pressure	Increasing Output Voltage			
Startup Time		S within TBD dB of final value, outputs AC coupled	-	-	15	ms

¹ Sensitivity and Supply Current are 100% tested.

2.2 Measurement Block Diagram 测试图

Figure 1: Typical Single-Ended Application Circuit

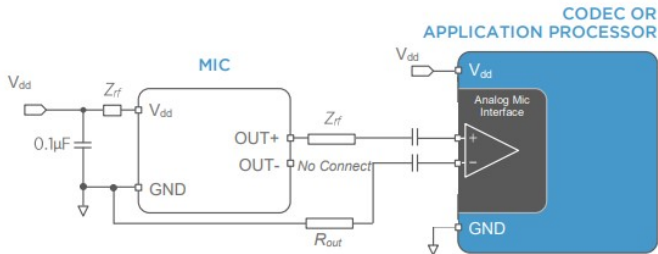
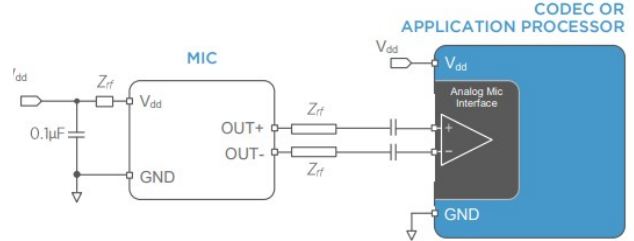
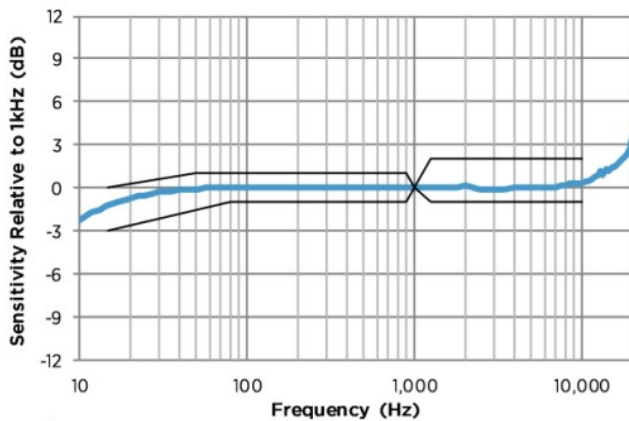


Figure 2: Typical Differential Mode Application Circuit



2.3 Typical Frequency Response Curve 频率响应曲线

Figure 3: Typical Free Field Magnitude Response



	15	50	80	900	1K	1.25K	3K	5K	8K	10K
USL	-0.0	1.0	1.0	1.0	0.0	1.0	1.0	1.5	2.0	2.25
LSL	-3.0	-2.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0	-1.0	-0.75

Figure 5: Typical THD vs SPL

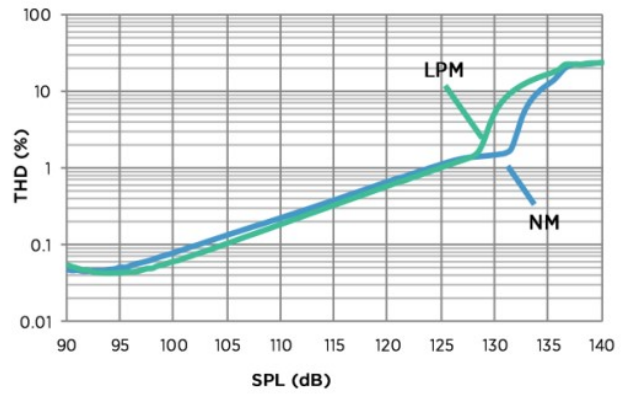


Figure 4: Typical Phase and Group Delay

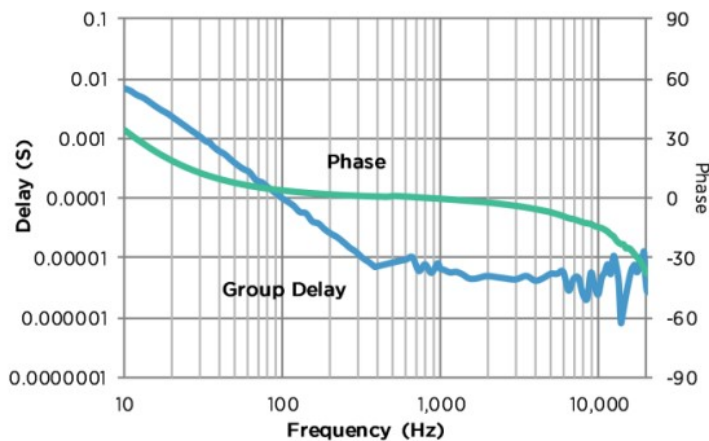


Figure 6: Typical THD vs Frequency

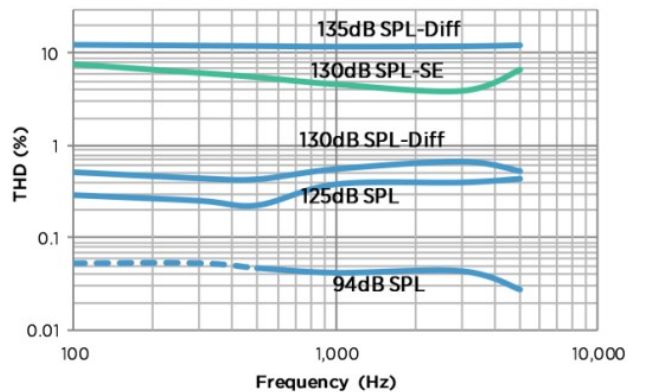


Figure 7: Typical Free Field Ultrasonic Response

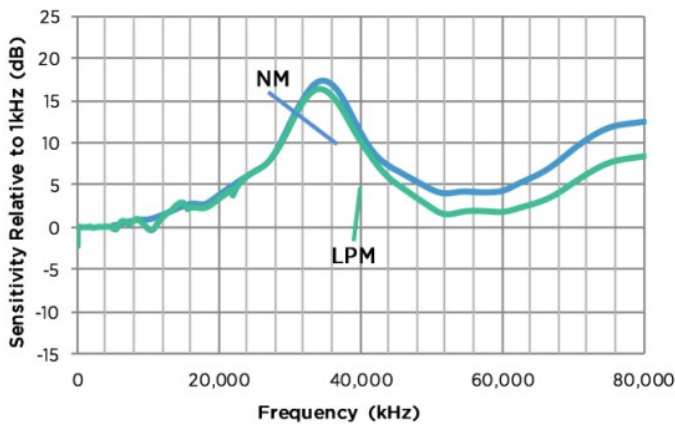


Figure 9: Typical Idd vs Vdd

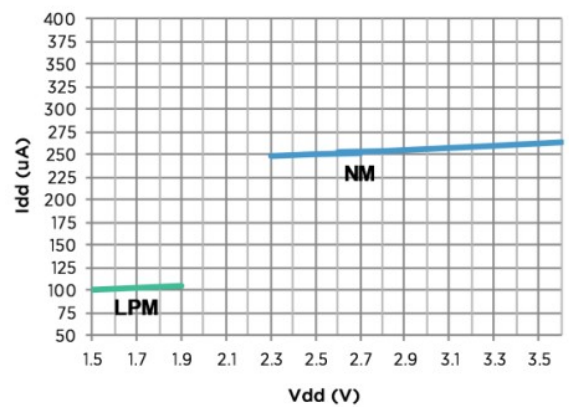


Figure 8: Noise Floor Power Spectral Density - LPM

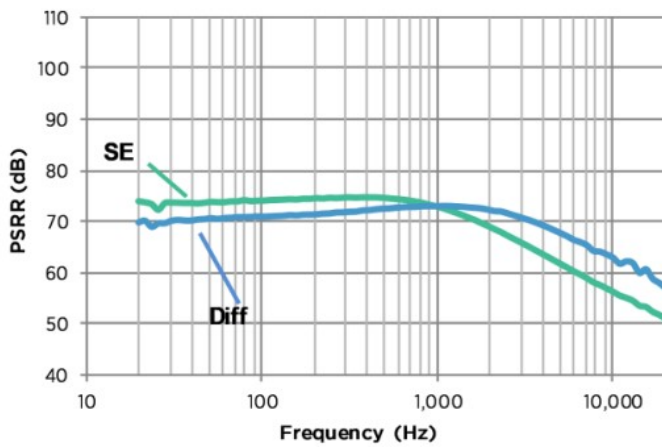


Figure 10: Noise Floor Power Spectral Density - NM

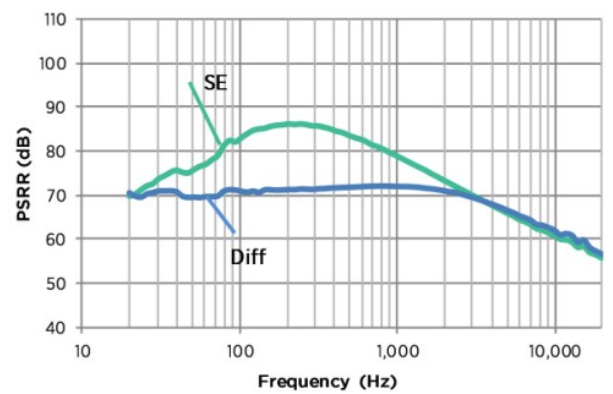


Figure 11: Typical PSRR - LPM

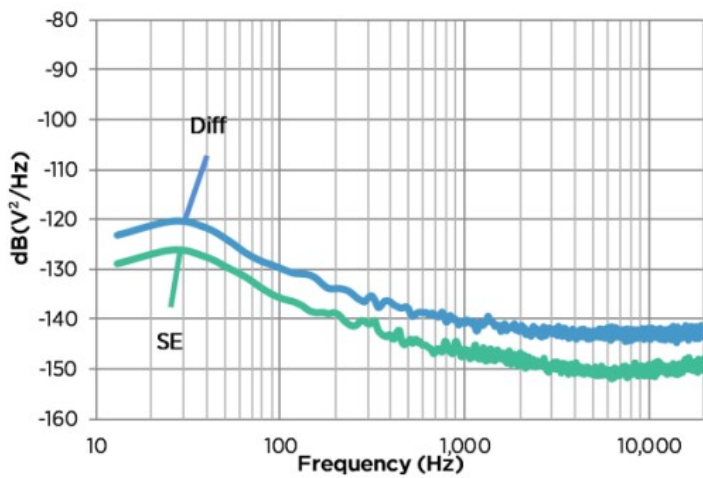
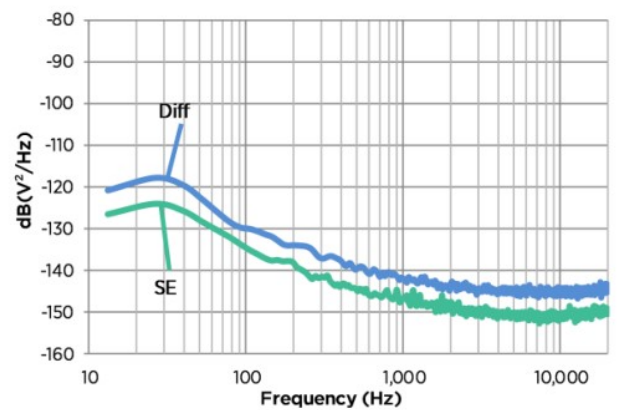


Figure 12: Typical PSRR - NM



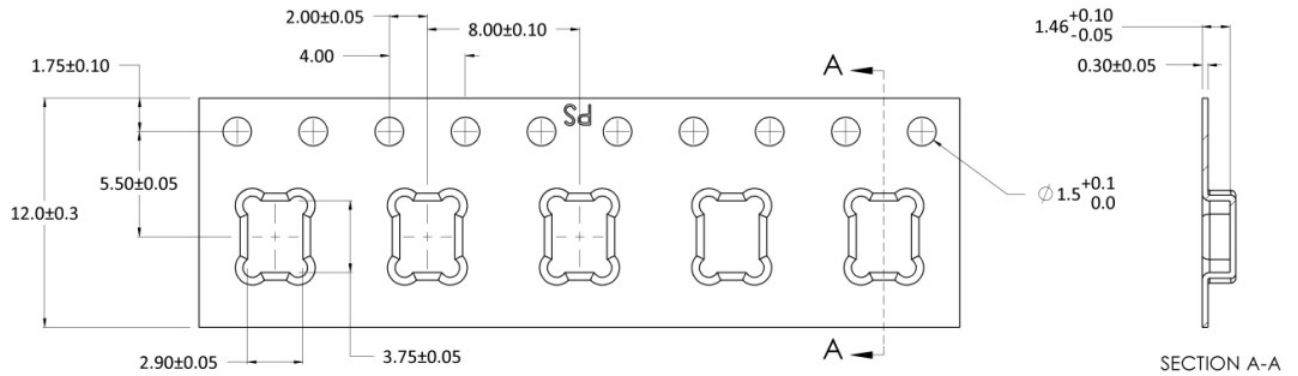
3. Mechanical characteristics and environmental test

机械特性和环境试验

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)
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)
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)
ESD-HBM	3 discharges of ±2 kV direct contact to I/O pins. (ESD STM5.2)
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 ±2 kV direct contact to I/O pins. (MIL 883E, Method 3015.7)
Reflow	5 reflow cycles with peak temperature of +260°C
Mechanical Shock	3 pulses of 10,000 G in the X, Y, and Z direction (IEC 68-2-27, Test Ea)

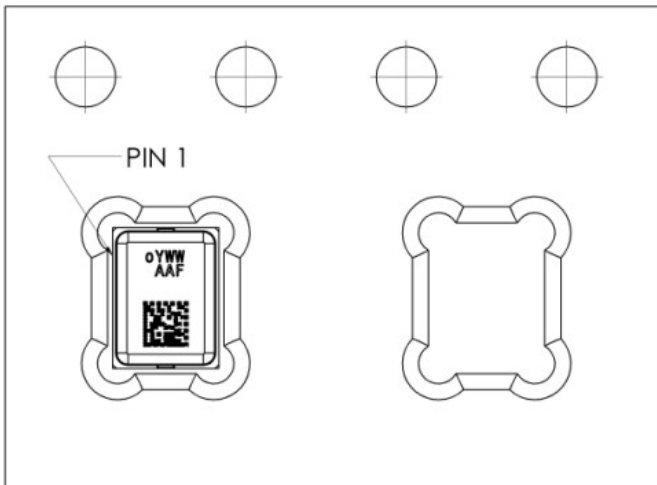
Note: After reliability tests are performed, the sensitivity of the microphones shall not deviate more than 3 dB from its initial value. After 3 reflow cycles, the sensitivity of the microphone shall not deviate more than 1dB from its initial value. 进行可靠性试验后，麦克风的灵敏度与初始值的偏差不得超过 3 dB。3 次回流循环后，传声器的灵敏度与初始值的偏差不得超过 1dB。

4. Packaging Specifications 包装规格



Model Number	Suffix	Reel	Quantity Per
SH1878LR5H-1	TBD	13"	TYBD

Component	Surface Resistance (ohms)
Reel	10^5 - 10^9
Carrier Tape	10^5 - 10^9
Cover Tape	10^4 - 10^{10}



Date Code YWW:

Y: Last digit of year

WW: Work week

AA = Project Name Designator:

AX: Tron

F = Factory Location:

M: Knowles Factory KEM3

C: Knowles Factory KES2

P: Knowles KEI

2D barcode "ABCDEFHIJKLMNOP":

Unique Job Identification Number for product traceability

NOTES:

Dimensions are in millimeters unless otherwise specified.

Vacuum pickup only in the pick area indicated in Mechanical Specifications.

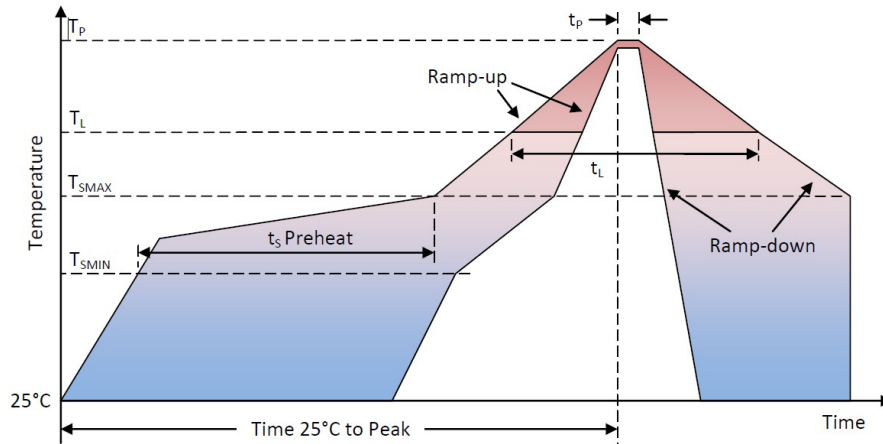
Tape & reel per EIA-481.

Labels applied directly to reel and external package.

Shelf life: Twelve (12) months when devices are stored in the factory-supplied, unopened ESD moisture sensitive bag under the maximum environmental conditions of 30°C, 70% R.H.

5.Solder Reflow Profile

回流焊条件



Profile Feature	Pb-Free
Average Ramp-up rate ($T_{S_{MAX}}$ to T_P)	3°C/second max.
Preheat <ul style="list-style-type: none"> • Temperature Min ($T_{S_{MIN}}$) • Temperature Max ($T_{S_{MAX}}$) • Time ($T_{S_{MIN}}$ to $T_{S_{MAX}}$) (t_s) 	150°C 200°C 60-180 seconds
Time maintained above: <ul style="list-style-type: none"> • Temperature (T_L) • Time (t_L) 	217°C 60-150 seconds
Peak Temperature (T_P)	260°C
Time within 5°C of actual Peak Temperature (t_p)	20-40 seconds
Ramp-down rate (T_P to $T_{S_{MAX}}$)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max

Notes: Based on IPC/JDEC J-STD-020 Revision C.

All temperatures refer to topside of the package, measured on the package body surface.

6. Additional Notes 注意事项

- (A) Shelf life: Twelve (12) months when devices are to be stored in factory supplied, unopened
- (B) ESD moisture sensitive bag under maximum environmental conditions of 30°C, 70% R.H.
- (C) 保质期: 在 30°C、70%相对湿度的最大环境条件下, 将设备储存在工厂提供的未打开的 ESD 湿敏袋中时, 保质期为十二 (12) 个月。
- (D) MSL (moisture sensitivity level) Class 1. MSL (水分敏感性水平) 1 级。
- (E) Maximum of 3 reflow cycles is recommended. 建议最多 3 个回流循环。
- (F) In order to minimize device damage: 为了尽量减少设备损坏:
- Do not board wash or clean after the reflow process.
 - 回流焊后, 不得进行板清洗或清洁。
 - Do not brush board with or without solvents after the reflow process.
 - 回流焊后, 不得在有溶剂或无溶剂的情况下刷板。
 - Do not directly expose to ultrasonic processing, welding, or cleaning.
 - 不要直接接触超声波处理、焊接或清洁。
 - Do not insert any object in port hole of device at any time.
 - 任何时候都不要设备的端口孔中插入任何物体
 - Do not apply over 30 psi of air pressure into the port hole.
 - 不要向端口孔施加超过 30 psi 的气压。
 - Do not pull a vacuum over port hole of the microphone.
 - 请勿将真空吸尘器拉过麦克风的端口孔。
 - Do not apply a vacuum when repacking into sealed bags at a rate faster than 0.5 atm/sec.
 - 当以超过 0.5 atm/sec 的速度重新包装到密封袋中时, 不要使用真空。

7. MATERIALS STATEMENT 材料声明

Meets the requirements of the European RoHS directive 2011/65/EC as amended.

Meets the requirements of the industry standard IEC 61249-2-21:2003 for halogenated substances and Knowles Green Materials Standards Policy section on Halogen-Free.

Ozone depleting substances are not used in the product or the processes used to make the product, including compounds listed in Annex A, B, and C of the "Montreal Protocol on Substances That Deplete the Ozone Layer."

符合经修订的欧洲RoHS指令2011/65/EC的要求。

符合行业标准IEC 61249-2-21:2003关于卤化物质和Knowles绿色材料标准政策部分关于无卤素的要求。产品或用于制造产品的工艺中未使用消耗臭氧层的物质, 包括《关于消耗臭氧层物质的蒙特利尔议定书》附件A、B和C中列出的化合物

