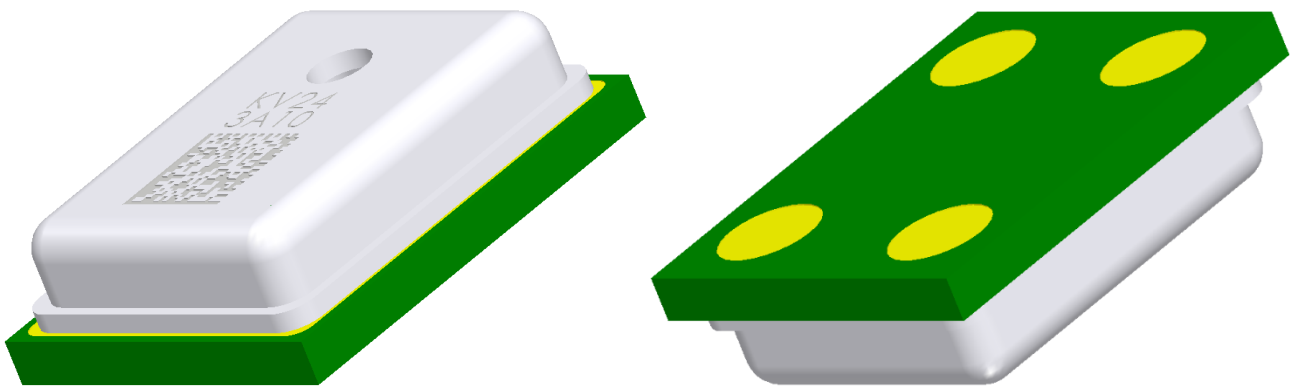


Top Port Analog MEMS Microphone

Model: MMA100-021



Description

MMA100 is a top port analog microphone built with MEMS acoustic sensor and IC, and is available in SMD compliant package.

Features

- ◆ Sensitivity -42 dB V/Pa
- ◆ Good signal to noise ratio 59.5 dB(A)
- ◆ Size 3.76 x 2.95 x 1.1mm
- ◆ Stable sensitivity over power supply range...1.6 – 3.6V
- ◆ Low Current consumption typ. 130μA
- ◆ Shielding suppression of EMI

Absolute maximum ratings

- ◆ Supply Voltage3.6V
- ◆ Sound Pressure Level160dB
- ◆ Mechanical Shock10000g
- ◆ VibrationPer MIL-STD-883 Method 2007, Test Condition A
- ◆ Temperature Range-40°C to +85°C

Applications

The MMA100 is available for

- ◆ Mobile Devices
- ◆ Teleconferencing System
- ◆ Notebook & Portable & Tablet Devices
- ◆ Headsets & Bluetooth devices
- ◆ Consumer (MP3 players, PDA, recording devices)

Environmental tests

The materials, components, and products supplied to customer, must follow up the Merry. Co., LTD. Purchasing Spec of “Green Policy” and the document title is “Environmental Material Control Procedure ” (DCC.NO:GP2-001).

Ordering Information

PART NUMBER	TEMP RANGE	QUANTITY PER REEL
88A100021001	-40 to 85 °C	5,200

STORAGE SPECIFICATIONS: MSL (moisture sensitivity level) Class 1.

CAUTION: Stresses above those listed in “Absolute maximum ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

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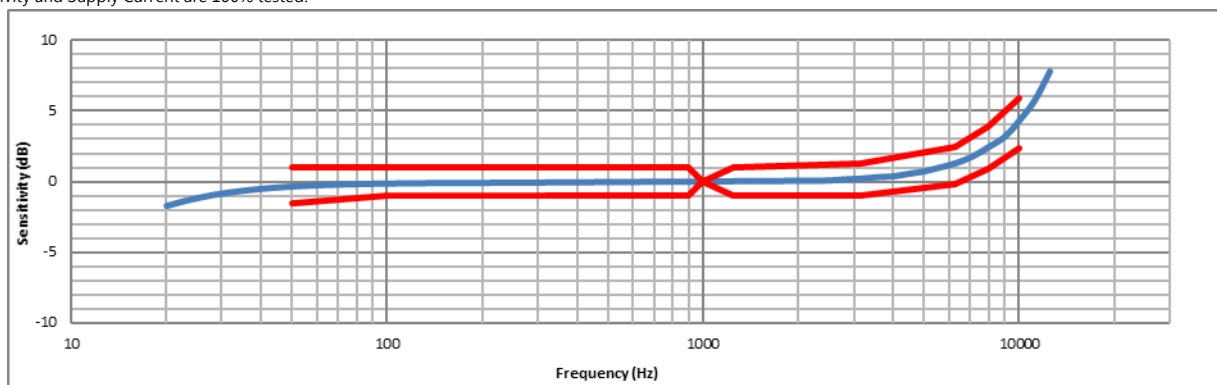
1. Product Specifications

Unless otherwise specified, test conditions are show as below:

- ◆ Temperature= 25 ± 2 °C, and room humidity= 60 ± 10 %

Items	Symbol	Condition	Limits			Unit
			Min.	Nom.	Max.	
Acoustic						
Directivity		Omni-directional				
Frequency Response	LFRO	Low frequency -3 dB point		15		Hz
Sensitivity	S	@1kHz (0dB=1V/Pa)	-43	-42	-41	dB V/Pa
Signal-to-noise ratio	S/N	@1kHz (0dB= 1V/Pa)		59.5		dB(A)
Total harmonic distortion	THD	At 94 dB SPL @ 1kHz			0.1	%
		At 110 dB SPL @ 1kHz			0.3	%
		THD 1% @ 1kHz		124		dB SPL
Maximum Acoustic Input	AOP	THD 10% @ 1kHz		134		dB SPL
Polarity		No inverting				
Electrical						
Supply voltage	V _{DD}		1.6		3.6	V
Output DC Voltage	V _{out,dc}			1		V
Output DC impedance	R _{out}			160	250	Ω
Current consumption	I _{DSS}	V _{dd} =3.0 volts	90	130	170	
Power Supply Rejection	PSR	100mVpp square wave@217Hz, VDD=3.0V, A-wt		-97		dB V(A)
Power Supply Rejection Ratio	PSRR	200mVpp sinewave@ 1kHz, VDD=& 3.0V		67		dB
Environmental						
Operating temperature			-40	-	+85	°C
Storage temperature			-40	-	+100	°C

*Sensitivity and Supply Current are 100% tested.



Frequency(Hz)	50	100	315	900	1K	1.25K	3.15K	6.3K	8K	10k
Upper Limit(dB)	+1.0	+1.0	+1.0	+1.0	0	+1.0	+1.3	+2.5	+3.9	+5.8
Lower Limit(dB)	-1.5	-1.0	-1.0	-1.0	0	-1.0	-1.0	-0.2	+0.9	+2.4

Figure 1: Frequency Response Mask (Normalized to 1 kHz)

2. Dimensions and Pin Description

The MMA100 is a top-port microphone designed specifically to be a drop-in replacement for other analog MEMS microphones with 3.76 x 2.95mm footprint.

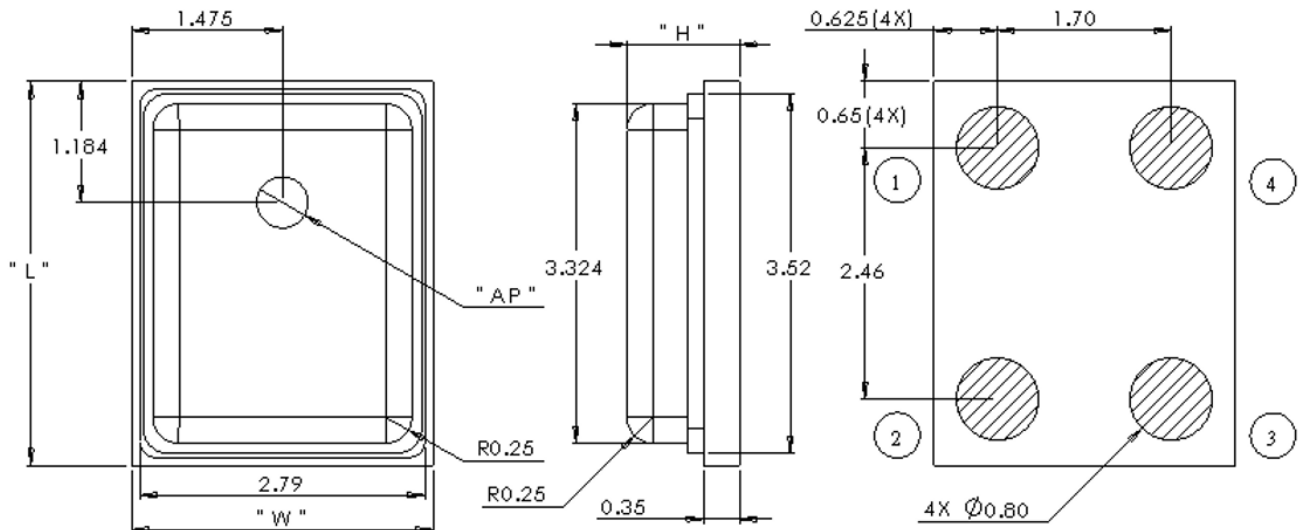


Figure 2: Pin configurations (Top view/Side view/Bottom view) (unit: mm)

Pin	Function	Dir	Description
1	VDD	P	Power supply
2	NC	NC	connect to ground
3	GND	G	Ground
4	OUT	O	Data output

Item	Dim.	Tol. (\pm)	Units
Length (L)	3.76	0.1	mm
Width (W)	2.95	0.1	mm
Height (H)	1.1	0.1	mm
Port (AP)	0.5	0.1	mm

Note:

Pick area extends to 0.25 mm of any edge or hole unless otherwise specified.

Tolerance is ± 0.15 mm unless otherwise specified.

3. Recommended Customer Landing Pattern

The recommended PCB land pattern for the MMA100 should have a 1:1 ratio to the solder pads on the microphone package. Care should be taken to avoid applying solder paste to the sound hole in PCB. The dimensions of suggested solder paste pattern refer to Figure 3.

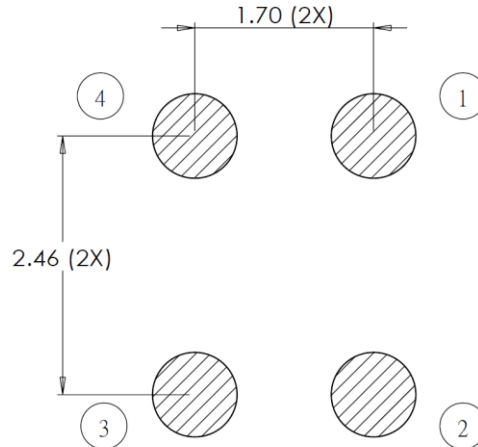


Figure 3: Top view of recommended landing pattern (unit: mm)

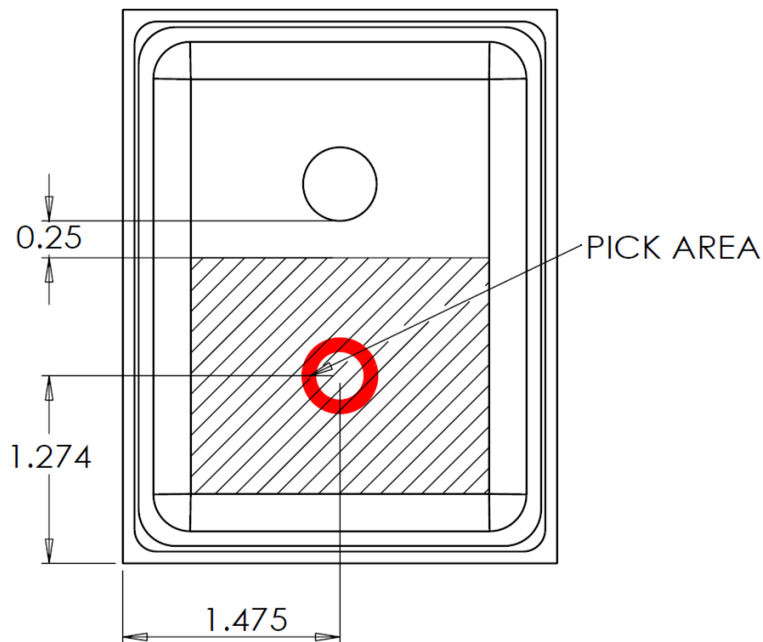


Figure 4: Recommended position of vacuum nozzle (unit: mm)

Note:

Tolerance of stencil mold and SMT process should be taken into consideration and make moderately adjustment on the stencil aperture dimensions.

4. Recommended Interface Circuit

The MMA100 output can be connected to a codec microphone input or to a high input impedance gain stage. A dc-blocking capacitor is required at the output of the microphone.

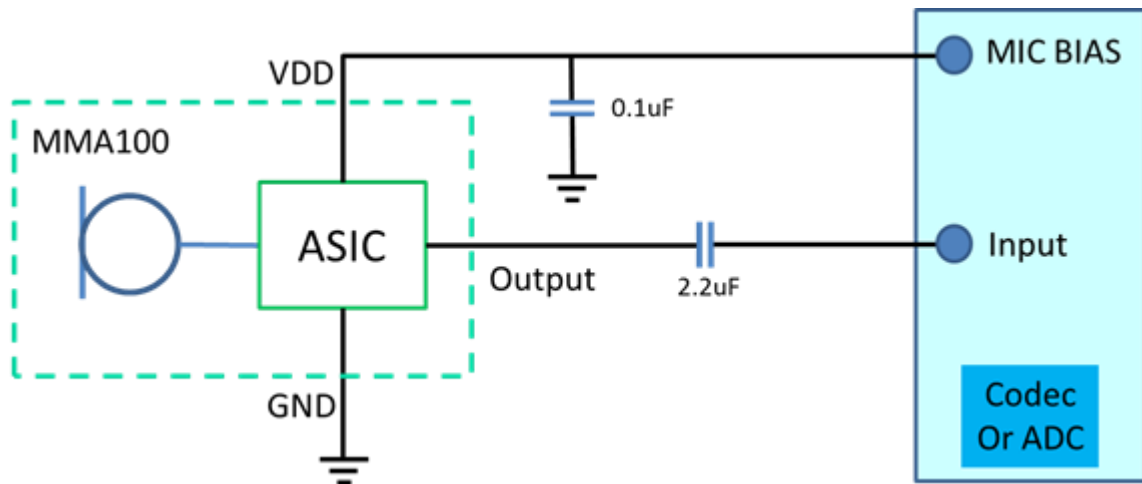


Figure 5: Connect to audio codec

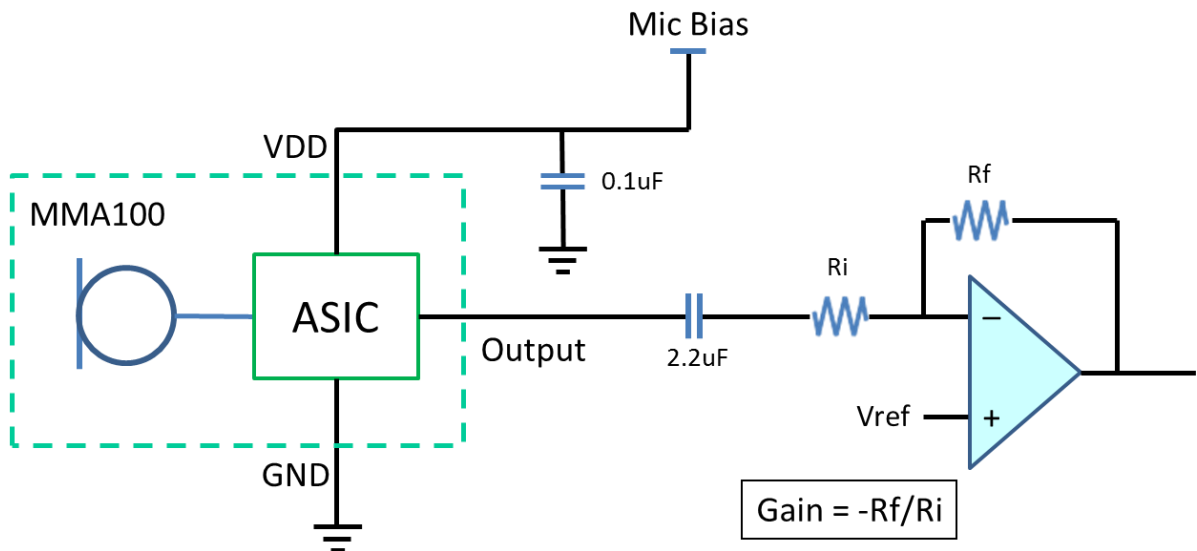


Figure 6: Connect to audio OPAMP

5. Soldering Reflow Profile

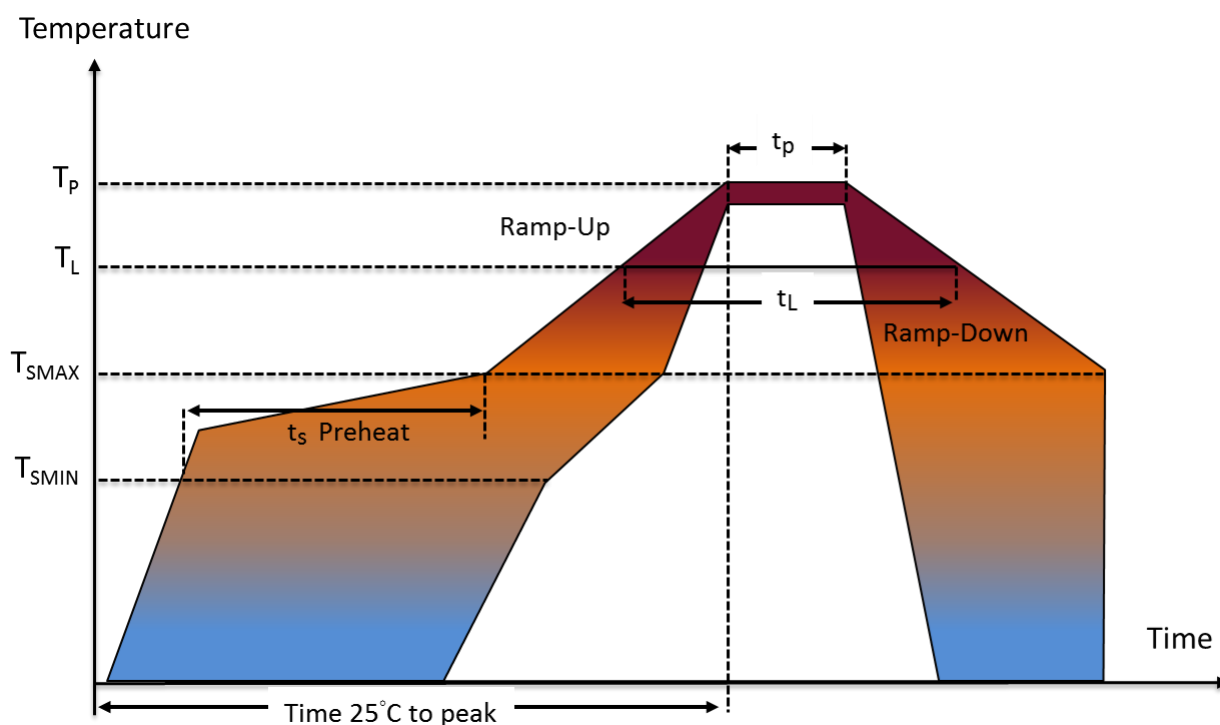


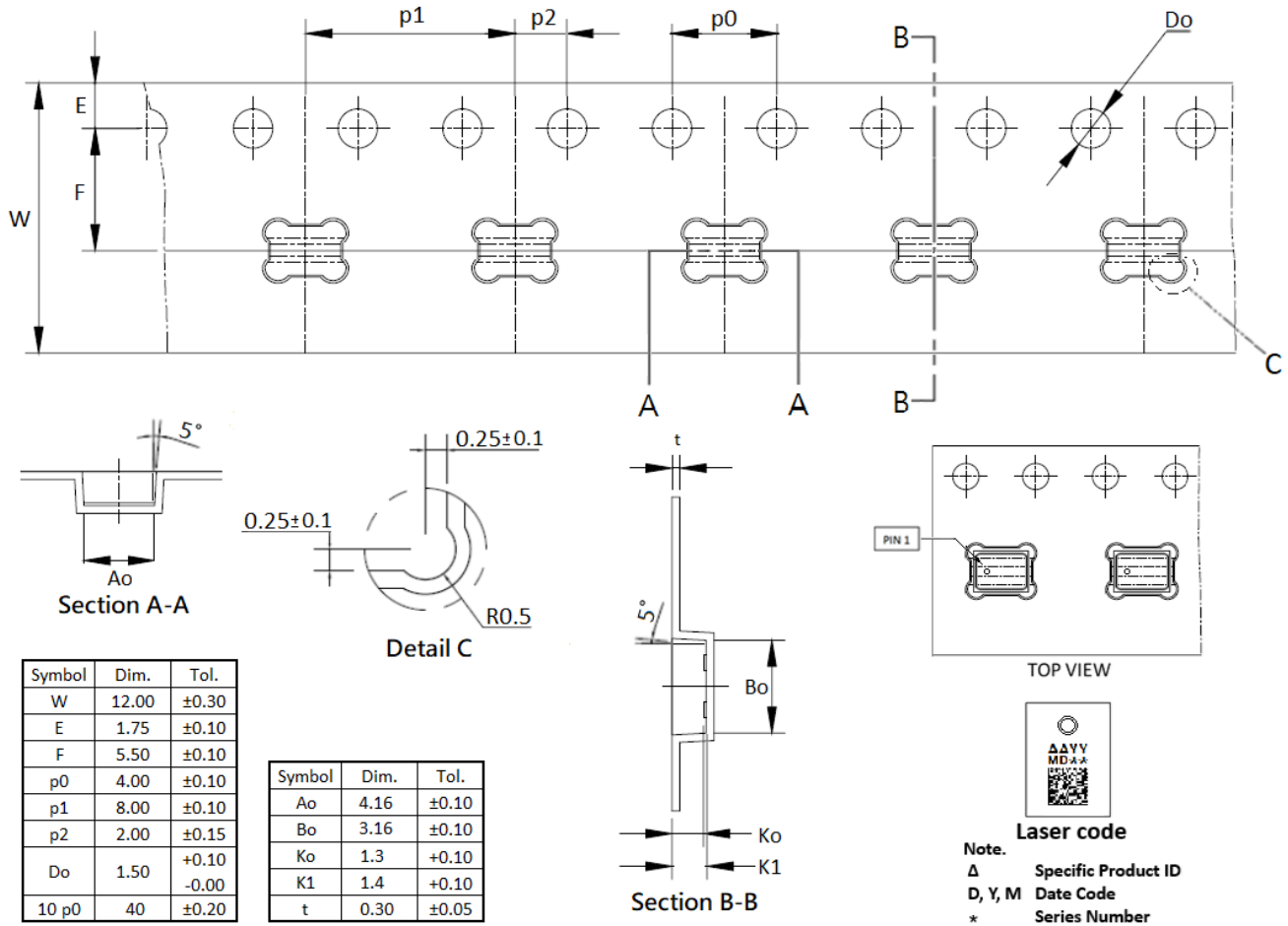
Figure 7: Recommend solder reflow profile

Profile feature	Temperature profile (T)	Time (t)
Preheat (T_s) ($T_{S_{MAX}}$ to $T_{S_{MIN}}$)	$T_{S_{MAX}}=180^{\circ}\text{C}$ $T_{S_{MIN}}=150^{\circ}\text{C}$	60-100 seconds
Peak Temperature (T_P) Time within 5°C of actual Peak Temperature(t_p)	$T_P=260^{\circ}\text{C}$ (Max)	20-30 seconds
Time maintained above Liquidus (T_L)	$T_L=220^{\circ}\text{C}$	40-80 seconds
Ramp-Up rate ($T_{S_{MAX}}$ to T_L)	180°C to 220°C	$1.25^{\circ}\text{C/seconds}$ max
Ramp-down rate (T_P to $T_{S_{MAX}}$)	260°C to 220°C	$3^{\circ}\text{C/seconds}$ max
Time 25°C to Peak Temperature	---	8 minutes max

Note:

- ◆ Do not pull a vacuum over the port hole of the microphone. Pulling a vacuum over the port hole can damage the device.
- ◆ Do not perform board wash after the reflow process. Board washing and cleaning agents can damage the device. Do not expose to ultrasonic processing or cleaning.
- ◆ Number of Reflow = recommend no more than 3 cycles
- ◆ To avoid the risk of the solder paste remelting, it's recommended that the furnace temperature should be lower than 245°C .

6. Packing Information



- Carrier camber is within 1 mm in 250 mm.
- Material: Black Polystyrene
- All dimensions meet EIA-481-C requirements.
- Packing length per 13'' reel: 46.5 Meters
- ESD Inspection item(Surface resistance):
 Carrier tape: $10.0 \times 10^5 \text{ohm/sqr} \sim 9.9 \times 10^9 \text{ohm/sqr}$
 Cover tape: $10.0 \times 10^5 \text{ohm/sqr} \sim 9.9 \times 10^9 \text{ohm/sqr}$
 Reel: $10.0 \times 10^4 \text{ohm/sqr} \sim 9.9 \times 10^{12} \text{ohm}$

Figure 8: Tape specification (unit: mm)

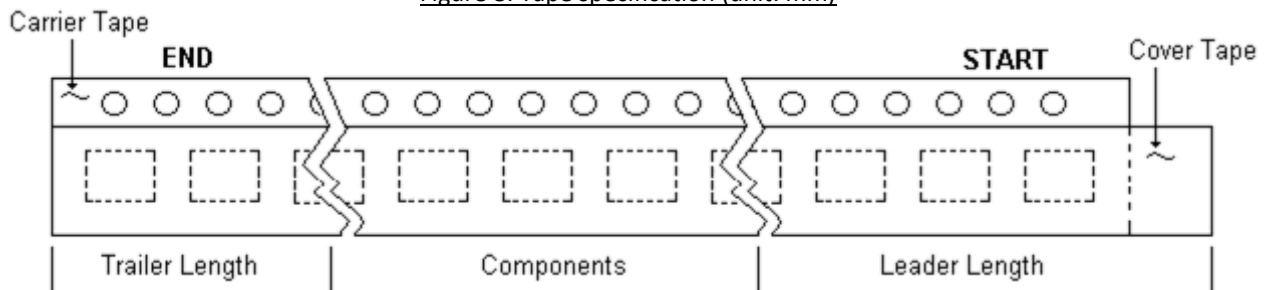


Figure 9: Definition of cover tape, carrier tape, trailer length and leader length

Trailer Length	Leader Length	Qty. Per
		13'' REEL
50 units	50units	5200

7. Reliability

The sensitivity of the microphone shall not deviate more than $\pm 3\text{dB}$ from its initial value after each test condition is performed.

Test item	Detail	Standard
Reflow simulation	Refer to solder reflow profile (p.9), total 5 times	
Moisture Sensitivity Level	1) baking: 125 °C / 24 hours. 2) the infiltration (Moisture Sensitivity Level 1) 3) after completion of the infiltration test of 15 minutes to 4 hours, finish the reflow soldering 3 times, top reflow temperature of 260 degrees	
Low temperature Storage	Conditions: $-40\pm 3^{\circ}\text{C}$ Duration: 1000 hours	IEC60068-2-1
High temperature Storage	Conditions: $105\pm 3^{\circ}\text{C}$ Duration: 1000 hours	IEC60068-2-2
Temperature shock	Conditions: 100 cycles of air-air thermal shock from -40°C to 125°C with 15 minute soaks.	IEC60068-2-4
Vibration test	12 minutes in each X, Y, Z axis from 20 to 2,000 Hz with peak acceleration of 20 G	MIL 883E, Method 2007.2,A
Temperature/Humidity Bias	$+85^{\circ}\text{C}$ / 85% R.H. environment while under max. supply voltage for 1,000 hours.	JESD22-A101A-B
Drop test	Conditions: It falls three times each 8 corner 6 surfaces and 12 sides by the case of 150g .The height is 1.53m from granite floor	IEC60068-2-32
ESD	LID/GND: 10 discharges of $\pm 8\text{ kV}$ direct contact to lid while unit is grounded ESD -HBM: 3 discharges of $\pm 2\text{ kV}$ direct contact to I/O pins. ESD -MM: 3 discharges of $\pm 200\text{ V}$ direct contact to I/O pins.	IEC 61000-4-2 MIL883E, Method 3015.7 ESD STM5.2
Low temperature Operational	Conditions: $-40\pm 3^{\circ}\text{C}$, V_{DD} = max. supply voltage Duration: 1000 hours	IEC60068-2-1
High temperature Operational	Conditions: $105\pm 3^{\circ}\text{C}$, V_{DD} = max. supply voltage Duration: 1000 hours	IEC60068-2-2
Mechanical Shock	Conditions: 10,000 G for 0.1ms in the $\pm X$, $\pm Y$, and $\pm Z$ direction Duration: 5 cycles of direction	IEC 68-2-27, Test Ea

8. Specification Revisions

Revision	Specification Changes	Date
A	Preliminary	06/26/2024
01	Initial Release	09/09/2024
02	Revise Pin configurations in Section2, P.4	09/20/2024