SV SensTech

华景传感科技

# Data Sheet

**Version 1.3/ December 2022**

## ML-4259-3722-T1L1

**拥有核心芯片技术的MEMS传感技术公司**

**A MEMS Sensor Company with Advanced Core Chip Technology**

**上海**
芯片研发：上海张江


**无锡**
研发测试中心：无锡高新区

**北京**
华北销售中心：北京海淀

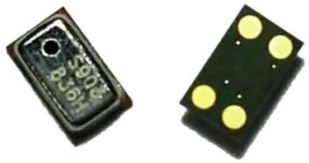
**德国**
芯片研发：斯图加特

**苏州**
封测生产：苏州高新区

**深圳**
华南销售中心：深圳南山

# Product Specification

# ML-4259-3722-T1L1
# Top -port analog silicon microphone



## Description

ML-4259-3722-T1L1 is high-performance analog top-port analog silicon microphone that receives the sound signal from the topside hole on lid. By using our own innovative and unique MEMS silicon microphone chip design, MicroLink Senstech provides a series of packaged MEMS silicon microphones with compact size to achieve high performance such as high SNR, high sensitivity, excellent reliability and broad frequency response. This series of MEMS microphones find wide applications in cell phones, tablets, wearable devices and other portable electronic devices.

## Features

- Compact size of 3.76×2.24×1.1 $mm^3$
- Sensitivity of -42dBV/Pa (±1dBV/Pa)
- High signal-to-noise ratio of 59 dB
- Extremely low THD of 0.1% at 94 dB SPL
- High acoustic overload point of 127 dB SPL
- High immune to RF/EM interference
- High mechanical strength
- High temperature resistance
- Excellent reliability

## Applications

Cell phones/smartphones, tablets, learning machines/game stations, MP3/DC/DV, computers/laptops, Bluetooth headsets/headphones, wearable smart systems, Iot related devices, etc.


## Absolute maximum ratings

Supply voltage: VDD to GND -0.3V～5V

ESD Tolerance:

Lid Mode 8kV

I/O Pin Mode 3kV

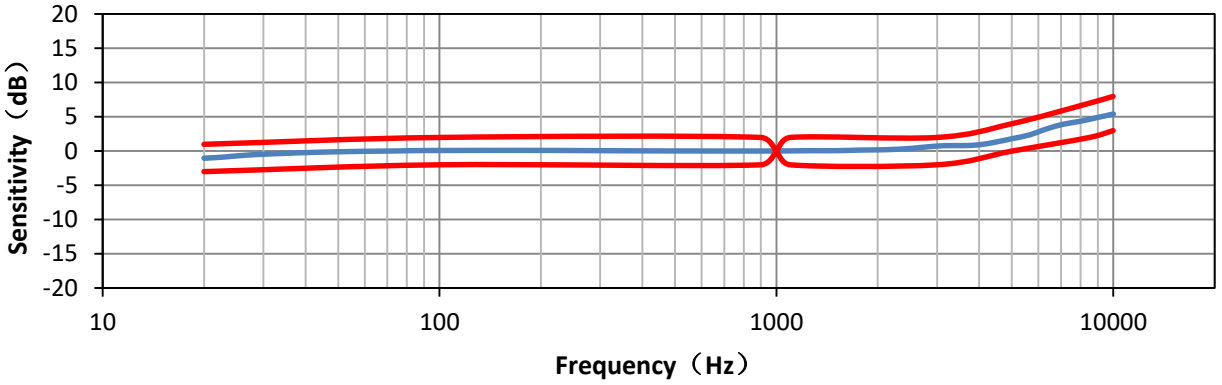
| Temperature Characteristics | | | | | |
|---|---|---|---|---|---|
| Parameter | Conditions | Min | Typ. | Max | Unit |
| Operating Temperature | | -40 | | +85 | ℃ |
| Storage Temperature | Solder on PC board | -40 | | +105 | ℃ |
| | In Tape and Reel | -10 | | +50 | ℃ |

## Acoustic and electrical specifications

Test conditions: 23⁰C±2⁰C, 55%±5% R.H., VDD=1.8V, no load, unless otherwise indicated

| Parameter | Symbol | Condition | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Sensitivity | Sens | 94dB SPL @1kHz | -43 | -42 | -41 | dBV/Pa |
| Signal to Noise Ratio | SNR | 20Hz to 20KHz, A-weighted | - | 59 | - | dB(A) |
| Output Impedance | $Z_{out}$ | @ 1 kHz | - | - | 200 | Ω |
| Supply Voltage | $V_{DD}$ | | 1.4 | - | 3.6 | V |
| Current Consumption | $I_{DD}$ | | - | 95 | 130 | μA |
| Dimension | | | 3.76×2.24×1.1 | | | $mm^2$ |
| Directivity | | | Omnidirectional | | | |
| Frequency Response | F | | 100~10k | | | Hz |
| Power Supply Rejection | PSR | 217Hz, 0.1Vpp Square on VDD | - | -100 | - | dBV(A) |
| Power Supply Rejection Ratio | PSRR | 200mVpp sine wave @ 1 kHz | - | 68 | - | dB |
| Total Harmonic Distortion | THD | 94 dB SPL @ 1kHz | - | 0.1 | - | % |
| | | 114 dB SPL @ 1kHz | - | 0.5 | - | % |
| Acoustic Overload Point | AOP | 10% THD @ 1kHz | - | 127 | - | dB SPL |

## Frequency response

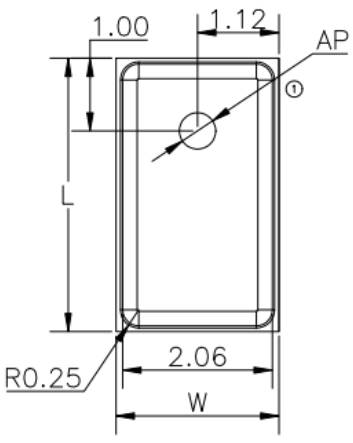



| Hz | 20 | 100 | 900 | 1000 | 1100 | 3000 | 5000 | 8500 | 10000 |
|---|---|---|---|---|---|---|---|---|---|
| USL | 1 | 2 | 2 | 0 | 2 | 2 | 4 | 7 | 8 |
| LSL | -3 | -2 | -2 | 0 | -2 | -2 | 0 | 2 | 3 |

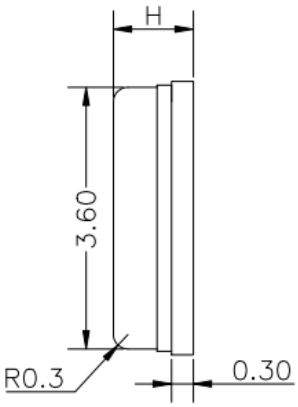
Figure 1. Typical free field frequency response (Normalized to 1 KHz)

## Mechanical specifications

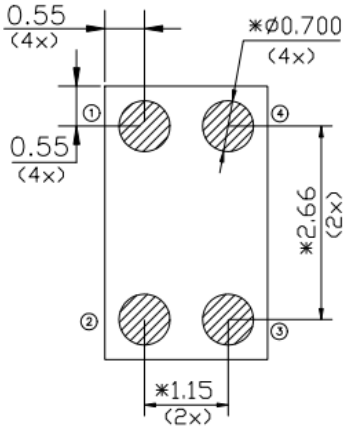
Top View




Side View




Bottom View

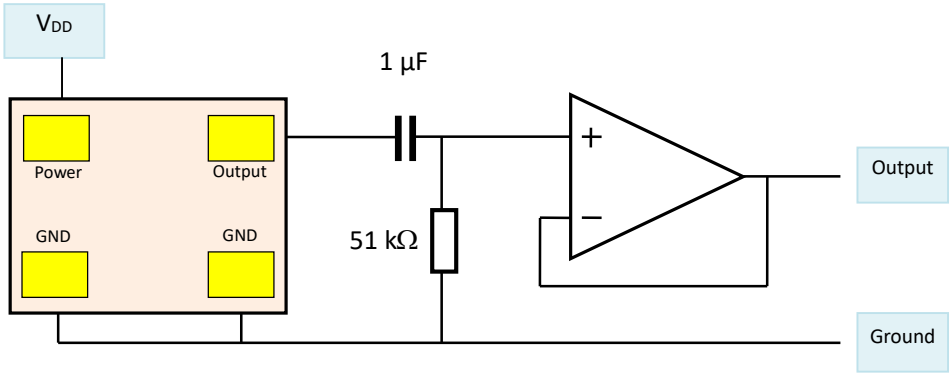


| Dimension | | |
|---|---|---|
| Item | Dimension | Tolerance |
| Length(L) | 3.76 mm | ±0.1 mm |
| Width(W) | 2.24 mm | ±0.1 mm |
| Height(H) | 1.10 mm | ±0.1 mm |
| AP | 0.5 mm | ±0.05 mm |

| Pin # | Pin Name | Description |
|---|---|---|
| ① | $V_{DD}$ | Power |
| ② | GND | Ground |
| ③ | GND | Ground |
| ④ | $V_{OUT}$ | Signal output |

Figure 2. Detailed mechanical drawings

- **Application circuit diaphragm**




- **Example land pattern**

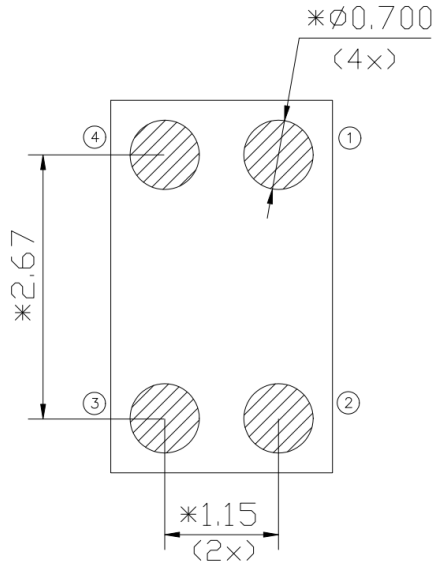
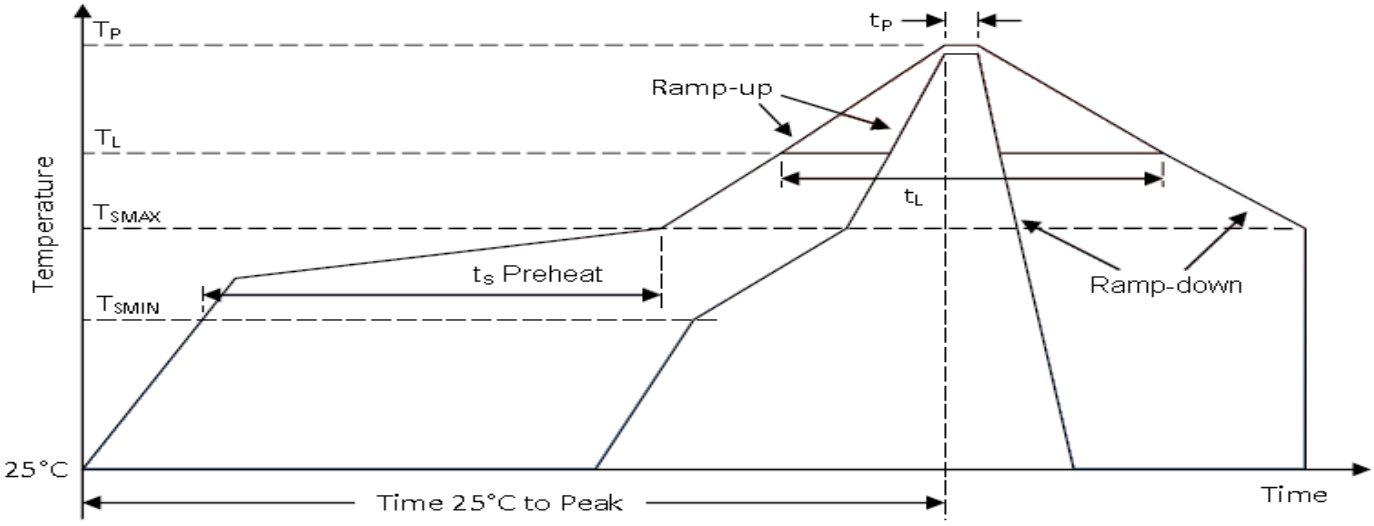



Figure 3. Recommended landing pattern on customers' PCB

- **Recommended reflow profile**




| Description | | Parameter（lead-free） |
|---|---|---|
| Average temperature change rate ($T_{SMAX}$ to $T_P$) | | 3ºC/second max. |
| Preheat | Minimum temperature ($T_{SMIN}$)<br>Maximum temperature ($T_{SMAX}$)<br>Time ($T_{SMIN}$ to $T_{SMAX}$) ($t_S$) | 150ºC<br>200ºC<br>60-180 seconds |
| Reflow | Temperature ($T_L$)<br>Time ($t_L$) | 217ºC<br>60-150 seconds |
| Peak temperature | Temperature ($T_P$)<br>Time（$t_P$） | 260ºC<br>20-40 seconds |
| Cooling rate($T_P$ to $T_{SMAX}$) | | 6ºC/second max |
| Time required from 25ºC to peak temperature | | 8 minutes max |

Figure 4. Recommended leadless solder reflow temperature profile

Notes:

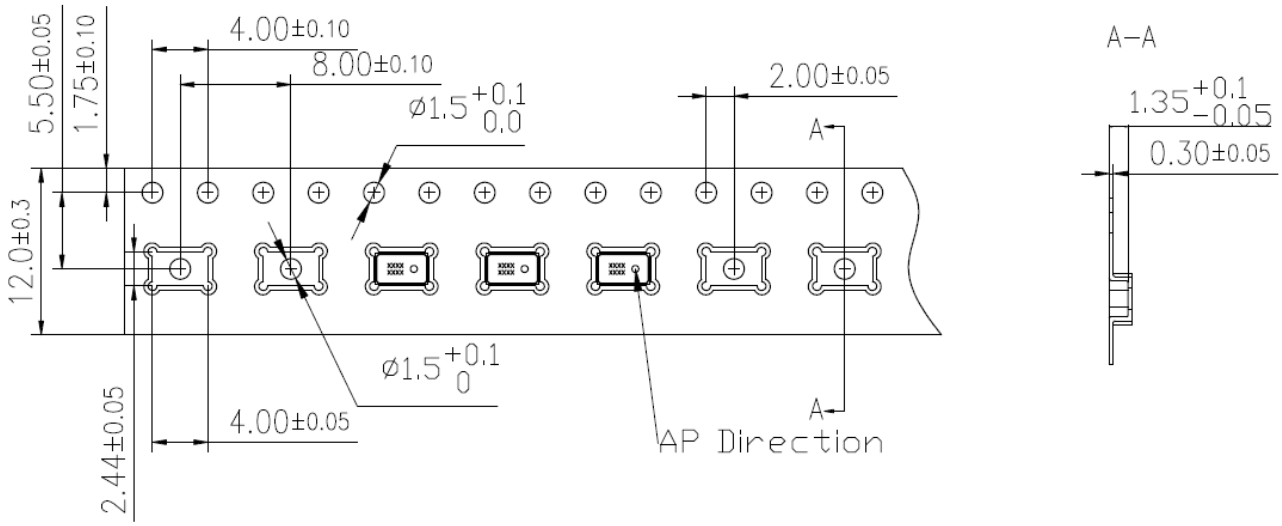
1) The air blow speed during reflow process should be low to avoid impurity entering the acoustic hole during reflow process.
2) Do not wash or clean the product to avoid impurity entering the product.
3) Do not carry out the reflow process more than 5 times. If the melting point of solders is lower, the peak temperature should be accordingly reduced.

## Reliability specifications

| Test Item | Description |
|---|---|
| Temperature/Humidity Bias | 1,000 hours at +85℃/85% R.H. under bias(JESD22-A101A-B) |
| Thermal shock | 100 cycles air-to-air thermal shock from -40℃ to +125℃ with 15minute soaks.( IEC 68-2-4) |
| High Temperature Storage | 1,000 hours at +105℃ environment(IEC 68-2-2) |
| Low Temperature Storage | 1,000 hours at -40℃ environment(IEC 68-2-1) |
| High Temperature Bias | 1,000 hours at +105℃ under bias(IEC 68-2-2) |
| Low Temperature Bias | 1,000 hours at -40℃ under bias(IEC 68-2-1) |
| Drop test | Using 150g fixture, 3 drops along each of 6 axes from 1.5m height onto slippery marble floor(IEC 68-2-27) |
| ESD-HBM | 3 discharges of ±3 kV direct contact to I/O pins. (MIL 883E, Method 3015.7) |
| 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 ±200 V direct contact to I/O pins. (ESD STM5.2) |
| Vibration test | 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) |
| Reflow test | 5 reflow cycles with peak temperature of +260℃ |
| Mechanical Shock | 3 pulses of 10,000 G in the X, Y, and Z direction(IEC 68-2-27, Test Ea) |
| Air Blow | Air pressure: 0.45MPa; Distance: 3cm; Duration: 10 seconds |

Notes: 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 3dB from its initial value.

## Packaging and marking detail




| Model Number | Reel Diameter | Quantity Per Reel | Quantity Per Carton |
|---|---|---|---|
| ML-4259-3722-T1L1 | 13” | 5,000 | 5,000 * 10 = 50,000Pcs |

Notes:

1) Dice are packaged in black carrier band which uses anti-electrostatic material. Each volume of packaged products is 5000 pcs.
2) The space between two dice is 8mm packaged in the carrier band with 12-mm width rolled in the reel of 13-inch diameter.
3) The package requirements mentioned below is the company’s standard delivery specifications. If you need special packages, please contact our sales staff.
4) All dimensions are in millimeters (mm) with tolerance of ± 0.3mm.

## Materials statement

- 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 SV SensTech Green Materials Standards Policy section on Halogen-Free.

## Remarks

- MSL (moisture sensitivity level) Class 1.
- Maximum of 3 reflow cycles is recommended.
- 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 the port hole of device at any time.
  - Do not apply over 30 psi of air pressure into the port hole.
  - Do not pull a vacuum over the port hole of microphone.
  - Do not apply a vacuum when repacking into sealed bags at a rate faster than 0.5 atm/sec.

## Version updates

| Version | Updated Content | Updated Date |
|---|---|---|
| 1.0 | Initial release | 2019-01-19 |
| 1.1 | Update Current<br>Logo change | 2021-9-17 |
| 1.2 | Update Reliability specifications | 2022-6-20 |
| 1.3 | Update Packaging and marking detail | 2022-12-01 |

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