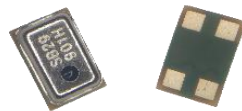


Product Specification

ML-3860-2718-T1L1 Top-port analog silicon microphone



● Description

ML-3860-2718-T1L1 is miniature, high-performance analog top-port analog silicon microphone that receives the sound signal from the top side 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.

- The ML-3860-2718-T1L1 has a sensitivity of -38dBV/Pa (tolerance of $\pm 1\text{dBV/Pa}$) with a signal-to-noise ratio of 60 dB, an extreme low total harmonic distortion of 0.1% at 94 dB SPL and very high acoustic overload point of 128 dB SPL.

● Features

- Metal cap housing package, immune to RF/EM interference.
- High mechanical strength, high temperature resistance and excellent reliability.
- Wide frequency response range, high sensitivity and pretty good signal-to-noise ratio.
- Withstand multiple times of SMT reflow process.

● **Applications**

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

The Lid Mode.....8kV

The I/O Pin Mode4kV

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

● Acoustic and electrical specifications

| Parameter | Symbol | Condition | Min. | Typ. | Max | Unit |
|------------------------------|------------------|-----------------------------|-----------------|------|-----|---------|
| Sensitivity | Sens | 94dB SPL @1kHz | -39 | -38 | -37 | dBV/Pa |
| Signal to Noise Ratio | SNR | 20Hz to 20KHz, A-weighted | - | 60 | - | dB (A) |
| Output Impedance | Z _{out} | @ 1 kHz | - | - | 200 | Ω |
| Supply Voltage | V _{DD} | | 1.6 | - | 3.6 | V |
| Current Consumption | I _{DD} | | - | 95 | 130 | μA |
| Dimension | | | 2.75×1.85×0.95 | | | mm |
| 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 sinewave @ 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 | - | 128 | - | dB SPL |

● Frequency response

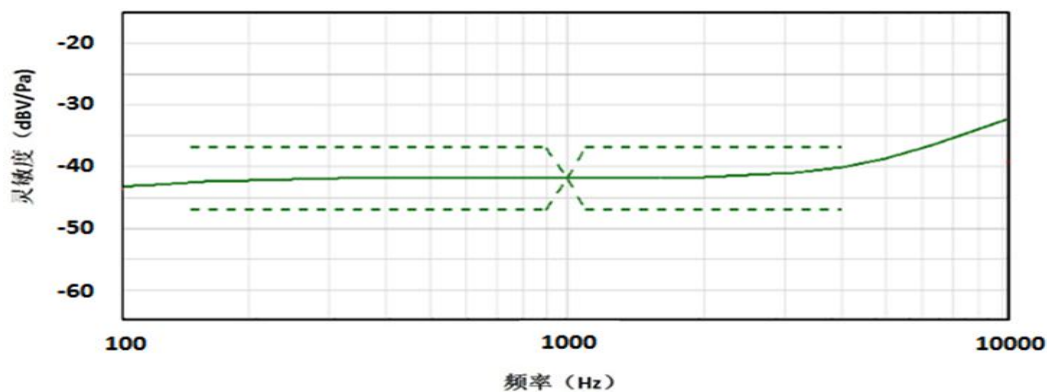
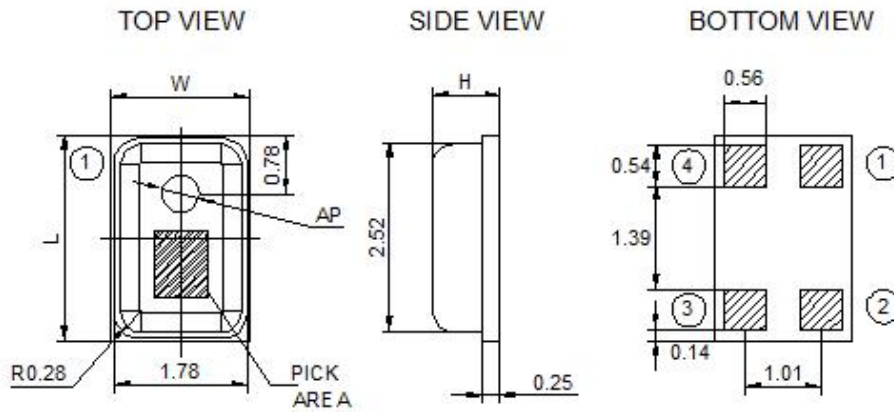


Figure 1. Typical free field frequency response

● Mechanical specifications

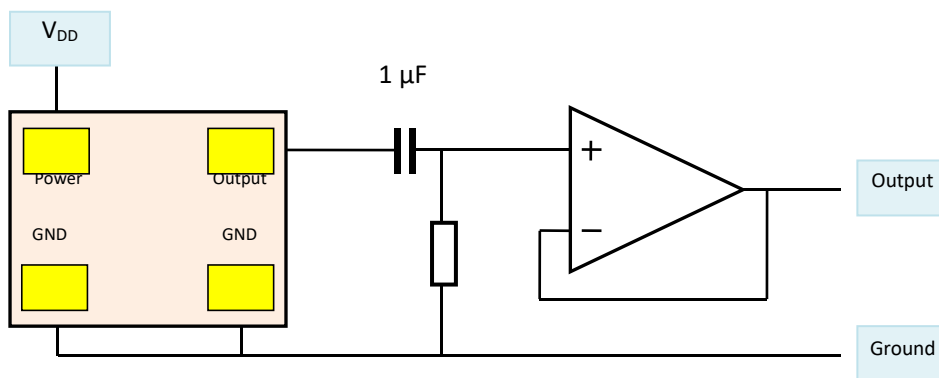


| Item | Dimension | Tolerance | Unit | Pin# | Pin Name |
|--------------------|-----------|-----------|------|------|----------|
| Length(L) | 2.75 | ±0.1 | mm | 1 | Output |
| With(W) | 1.85 | ±0.1 | mm | 2 | GND |
| Hight(H) | 0.95 | ±0.1 | mm | 3 | GND |
| Acoustic Port (AP) | ∅0.50 | ±0.05 | mm | 4 | VDD |

Notes: Dimensions are millimeters otherwise specified.
Tolerance is ±0.1mm unless otherwise specified.

Figure 2. Detailed mechanical drawings

● Block diaphragm



● Example Land Pattern

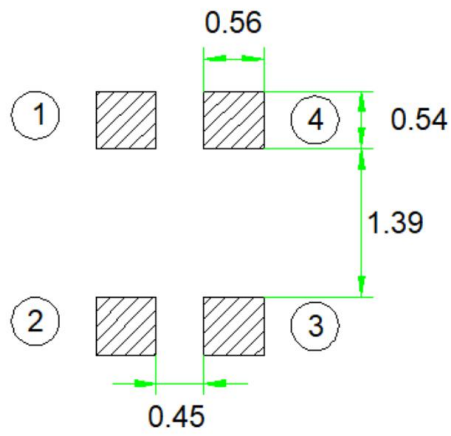
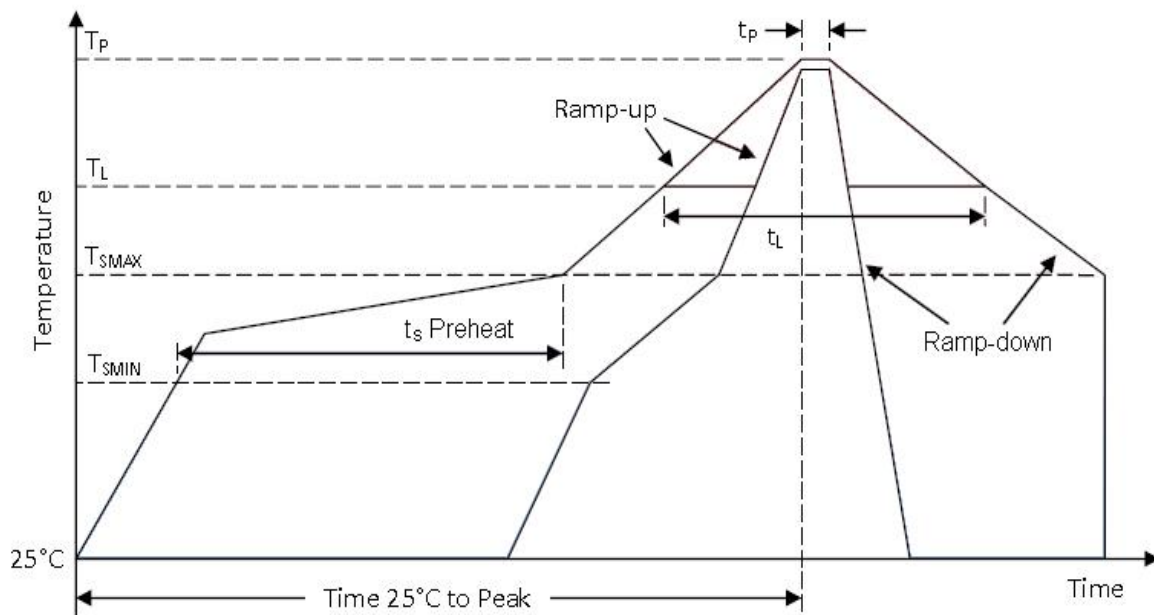


Figure 3. Recommended landing pattern on customers' PCB

● Recommended Reflow profile



| Description | | Parameter (lead-free) |
|--|---|-----------------------|
| Average temperature change rate ($T_{S_{MAX}}$ to T_p) | | 3°C/second max. |
| Preheat | Minimum temperature ($T_{S_{MIN}}$) | 150°C |
| | Maximum temperature ($T_{S_{MAX}}$) | 200°C |
| | Time ($T_{S_{MIN}}$ to $T_{S_{MAX}}$) (t_s) | 60-180 seconds |
| Reflow | Temperature (T_l) | 217°C |
| | Time (t_l) | 60-150 seconds |
| Peak temperature | Temperature (T_p) | 260°C |
| | Time (t_p) | 20-40 seconds |
| Cooling rate (T_p to $T_{S_{MAX}}$) | | 6°C/second max |
| Time required from 25°C to peak temperature | | 8 minutes max |

Figure 4. Recommended leadless solder reflow temperature profile

Notes:

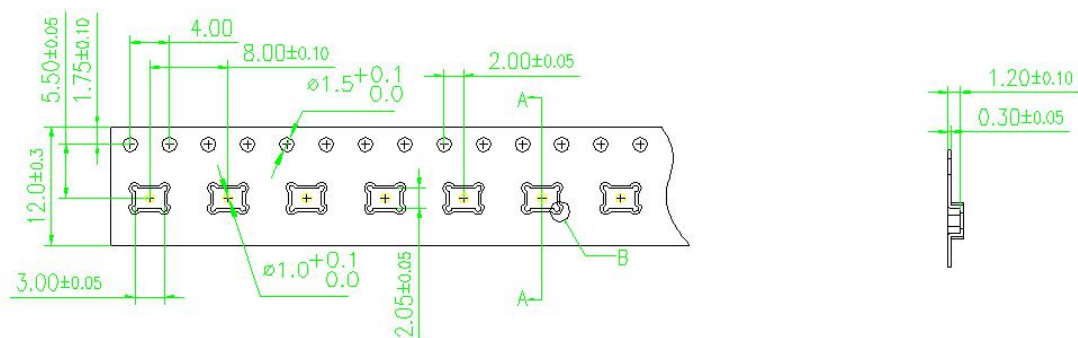
- 1) The air speed during reflow process should be low to avoid impurity entering the acoustic hole during reflow process.
- 2) Do not wash or clean the product to avoid impurity entering the product.
- 3) Do not carry out the reflow process more than 5 times. If the melting point of solder is lower,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

● Reliability Specifications

| Test Item | Description |
|---------------------------|--|
| Temperature/Humidity Bias | 1,000 hours at +85°C/85% R.H. under bias (JESD22-A101A-B) |
| Thermal shock | 100 cycles air-to-air thermal shock from -40°C to +125°C with 15minute soaks. (IEC 68-2-4) |
| High Temperature Storage | 1,000 hours at +105°C environment (IEC 68-2-2) |
| Low Temperature Storage | 1,000 hours at -40°C environment (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 ± 2 kV direct contact to I/O pins. (MIL 883E, Method 3015.7) |
| ESD-HBM | 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°C |

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-3860-2718-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 first 50 pcs and the last 20 pcs are vacant.
- 4) The package requirements mentioned below is the company's standard delivery specifications. If you need special packages, please contact our sales staff.
- 5) All dimensions are in millimeters (mm) with tolerance of $\pm 0.3\text{mm}$.

● 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

- (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 over 30 psi of 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.

● Version updates

| Version | Updated Content | Updated Date |
|---------|--------------------------------|--------------|
| 1.0 | Initial release | 2021-01-19 |
| 1.1 | Updated Current Logo change | 2021-09-17 |
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