

3SM222KMT1KA MEMS Microphone IC

Product Description

The *3SM222KMT1KA* microphone IC are integrated with specialized pre-amplification & analog-to-digital converter ASIC to provide high SNR output from a capacitive audio sensor. It's packaged for surface mounting and high temperature re-flow assembly. *3SM222KMT1KA* is ideal in many compact portable consumer electronic devices such as Notebook, TV, Smart Speaker.

Features

- High stability - no risk of membrane aging
- Suitable for automatic pick-and-place handler and SMT process
- Pulse density modulator (PDM) output interface supports two microphones on a single data line
- Miniature dimension 4.00mm x 3.00mm x 1.00mm
- RoHS/Green Compliant
- Sensitivity deviation within ± 1 dB
- Package type : LGA 8-pin

Applications

- Notebooks
- TVs
- Smart Speakers
- IoT Devices

Table of Contents

Product Description	P.1
Features	P.1
Applications	P.1
Table of Contents.....	P.2
Acoustical and Electrical Characteristics.....	P.3
Functional Block Diagram.....	P.6
Timing characteristics.....	P.6
Temperature Range.....	P.7
Reliability Qualifications	P.7
Reflow Profile	P.8
Pin Definition and Function	P.9
Frequency Response.....	P.10
PCB Land Pattern Layout	P.11
Functional Block Diagram	P.11
Application Circuit	P.12
Handling Instructions	P.13
Dimensions	P.14
Package Information.....	P.15
Revision History.....	P.17

Acoustical and Electrical Characteristics

Table 1. General Microphone Specifications

*Typical test conditions are TA = 23 °C, VDD = 2.1V, Clock=2.4MHz and R.H. = 50 %
measured in a pressure chamber test setup. All voltages refer to GND node*

Parameters	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Supply Voltage	Vdd	1.6		3.6	V	
Output Load	C _{Load}			100	pF	
Wake-up Time ⁽¹⁾			100		ms	Fclk ≥ 1MHz
Sleep Time			1		ms	Fclk ≤ 1KHz

Table 2. Performance Mode Microphone Specifications

*Typical test conditions are TA = 23 °C, VDD = 2.1V, Clock=2.4MHz and R.H. = 50 %
measured in a pressure chamber test setup. All voltages refer to GND node*

Parameters	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Acoustic						
Sensitivity	S	-27	-26	-25	dBFS	1kHz, 94dB SPL
Signal to Noise Ratio	S/N		64		dBA	A-weighted
Equivalent Noise Level	ENL		30		dBA	A-weighted
Total Harmonic Distortion	THD		<0.2		%	94dB SPL
Acoustic Overload Point	AOP		120		dB SPL	10% THD@1kHz, S = Typ.
Electrical						
Clock Frequency	Fclk	1.0		3.25	MHz	
Current Consumption	I _{sb}		650		μA	
Power Supply Rejection Ratio	PSRR		42		dBV/FS	1KHz, 200 mV peak to peak sinewave
Power Supply Rejection	PSR+N		-75		dBFS (A)	217hz, 100 mV 1/8 duty cycle peak to peak square wave superimposed on Vcc 2.1V, A-weighted

Table 3. Low-Power Mode Microphone Specifications

Typical test conditions are $T_A = 23\text{ }^\circ\text{C}$, $V_{DD} = 2.1\text{V}$, $\text{Clock} = 768\text{KHz}$ and $R.H. = 50\%$ measured in a pressure chamber test setup. All voltages refer to GND node

Parameters	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Acoustic						
Sensitivity	S	-27	-26	-25	dBFS	1kHz, 94dB SPL
Signal to Noise Ratio	S/N		64		dB	A-weighted
Equivalent Noise Level	ENL		30		dB	A-weighted
Total Harmonic Distortion	THD		<0.2		%	94dB SPL
Acoustic Overload Point	AOP		120		dB SPL	10% THD@1kHz, S = Typ.
Electrical						
Clock Frequency	Fclk	350		800	KHz	
Current Consumption	Isb		330		μA	
Power Supply Rejection Ratio	PSRR		42		dBV/FS	1KHz, 200 mV peak to peak sinewave
Power Supply Rejection	PSR+N		-75		dBFS (A)	217hz, 100 mV 1/8 duty cycle peak to peak square wave superimposed on Vcc 2.1, A-weighted

Table 4. Sleep Mode Microphone Specifications

Typical test conditions are $T_A = 23\text{ }^\circ\text{C}$, $V_{DD} = 2.1\text{V}$, $\text{Clock} = 0\text{KHz}$ and $R.H. = 50\%$ measured in a pressure chamber test setup. All voltages refer to GND node

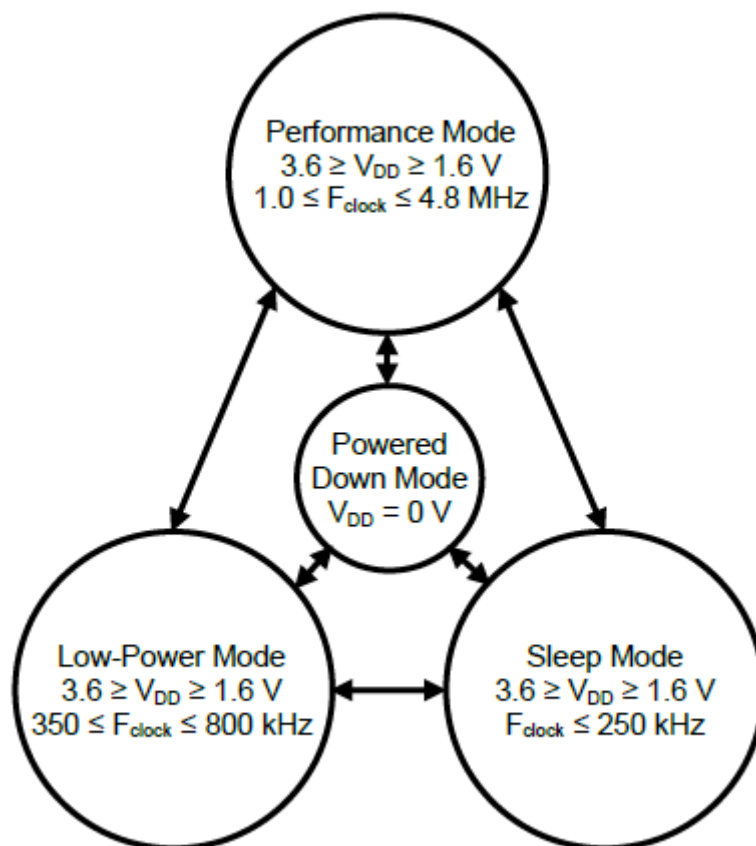
Parameters	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Clock Frequency	Fclk	0		250	KHz	
Current Consumption Sleep Mode	Isleep		10		μA	Clock = VDD or GND

Table 5. Microphone Interface Specifications

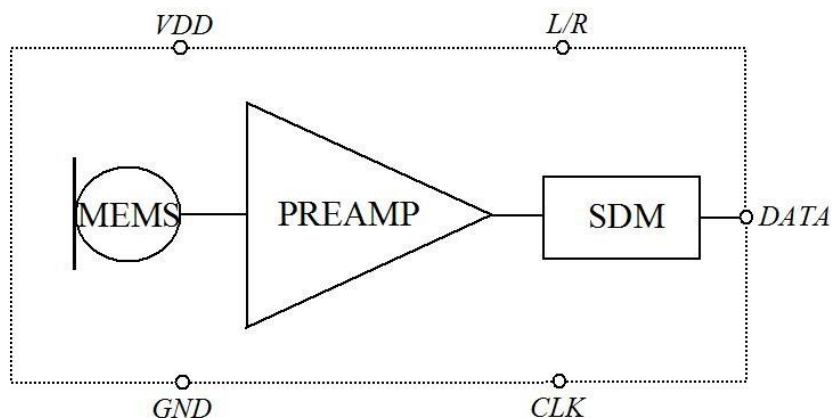
Parameters	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Logic Input High	V_{IH}	0.65x VDD		VDD	V	
Logic Input Low	V_{IL}	-0.3		0.35x VDD	V	
Logic Output High	V_{OH}	0.65x VDD		VDD	V	$I_{out} = 1\text{mA}$
Logic Output Low	V_{OL}	0		0.35x VDD	V	$I_{out} = 1\text{mA}$
Clock Duty Cycle		40		60	%	

1. Time from the first clock edge to valid output data

State Diagram



Functional Block Diagram



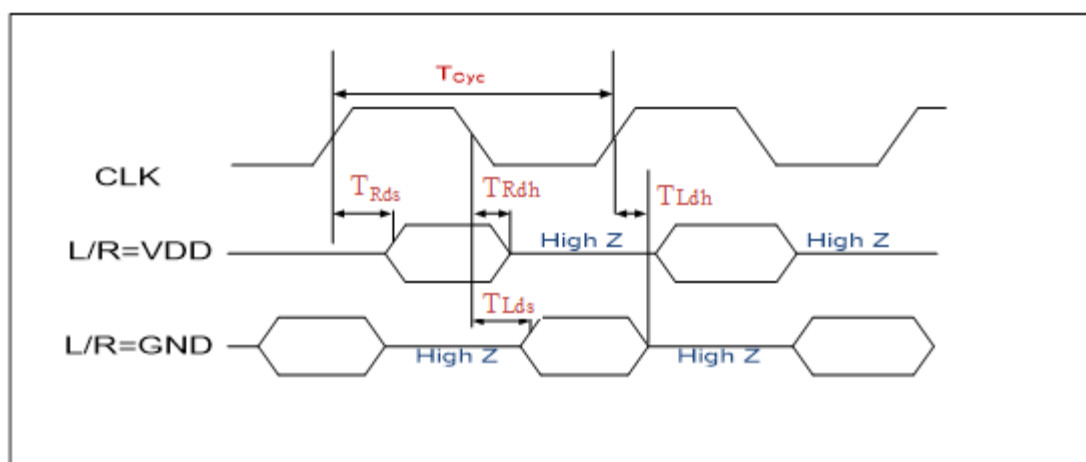
Timing characteristics

Table 6.

Parameters	Description	Min.	Max.	Unit
T_{cyc}	Clock period for normal mode	308	1000	ns
T_{RDS}	Data Setup Time, L/R pin=1	30 ⁽¹⁾		ns
T_{RDH}	Data Hold Time, L/R pin=1		20 ⁽¹⁾	ns
T_{LDS}	Data Setup Time, L/R pin=0	30 ⁽¹⁾		ns
T_{LDH}	Data Hold Time, L/R pin=0		20 ⁽¹⁾	ns

(1). Guaranteed by design

Timing waveforms



Temperature Range

Table 7.

Storage Temperature	T _{STG}	-40°C ~ 100°C
Operating Temperature Range	T _A	-40°C ~ 85°C

Reliability Qualifications

Table 8.

Test Item	Description
High Temperature Storage	Storage at 105°C for 1,000 hours IEC 60068-2-2 Test Ba
Low Temperature Storage	Storage at -40°C for 1,000 hours IEC 60068-2-1 Test Aa
High Temperature Operation Bias	Under Bias at 105°C for , 1,000 hours IEC 60068-2-2 Test Ba
Low Temperature Operation Bias	Under Bias at -40°C for , 1,000 hours IEC 60068-2-1 Test Aa
Temperature Humidity Bias	Under Bias at 85°C/85%RH for 1,000 hours JESD22-A101-B
Thermal Shock	Thermal Shock 100 cycles from -40°C~100°C, 100 cycles IEC 60068-2-14
Reflow	5 reflow cycles with peak 260°C J-STD-020D
Vibration	4 cycles lasting 12 minutes from 20 to 2,000Hz in X, Y and Z with peak acceleration of 20G MIL 883E, Method 2007.2, A
Shock	3 pulses 10,000G in X,Y and Z IEC 60068-2-27, Test Ea
ESD	HBM: 3KV, MM:300V, CDM:500V JESD22-A114(HBM); JESD22-A115(MM)

Reflow Profile

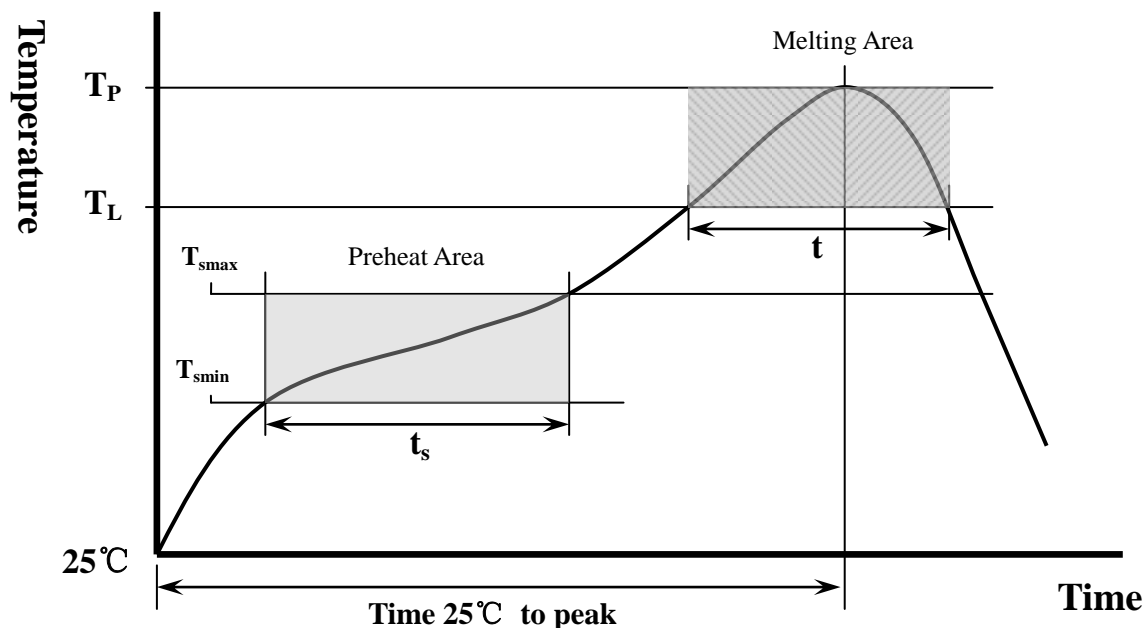
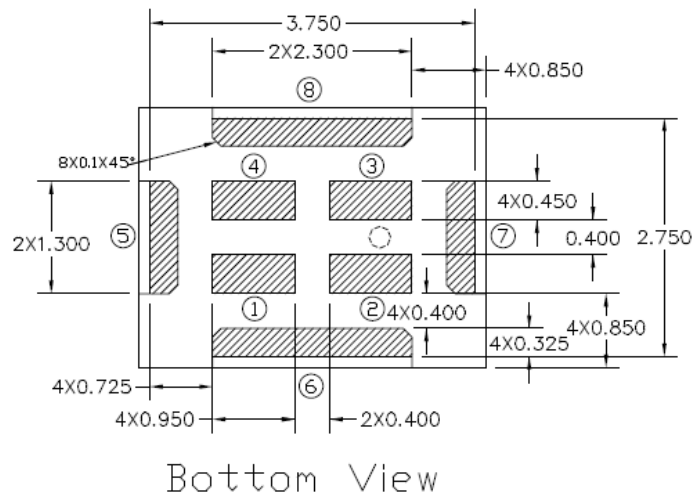
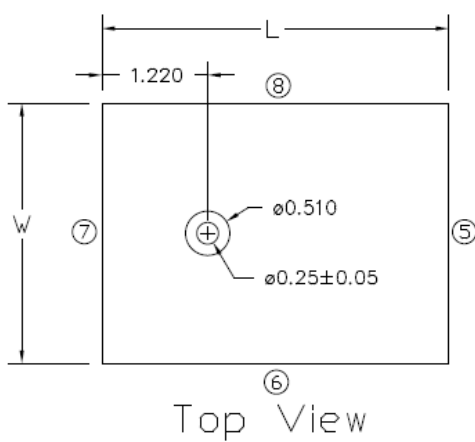


Table 9. Recommended Reflow Profile Limits

Profile Feature	Pb-free
Preheat	
Minimum temperature (T_{smin})	150 °C
Maximum temperature (T_{smax})	200 °C
Time (t_s)	60~180 sec
Average Ramp up rate (T_{smax} to T_P)	3 °C/sec
Melting area	
Melting temperature (T_L)	217 °C
Time maintained above melting (t)	60~150 sec
Peak Temperature (T_P)	260 °C
Time within 5°C of actual peak temperature	20~40 sec
Ramp down rate	6 °C/sec maximum
Time 25°C to peak temperature	8 minute maximum

Pin Definition and Function



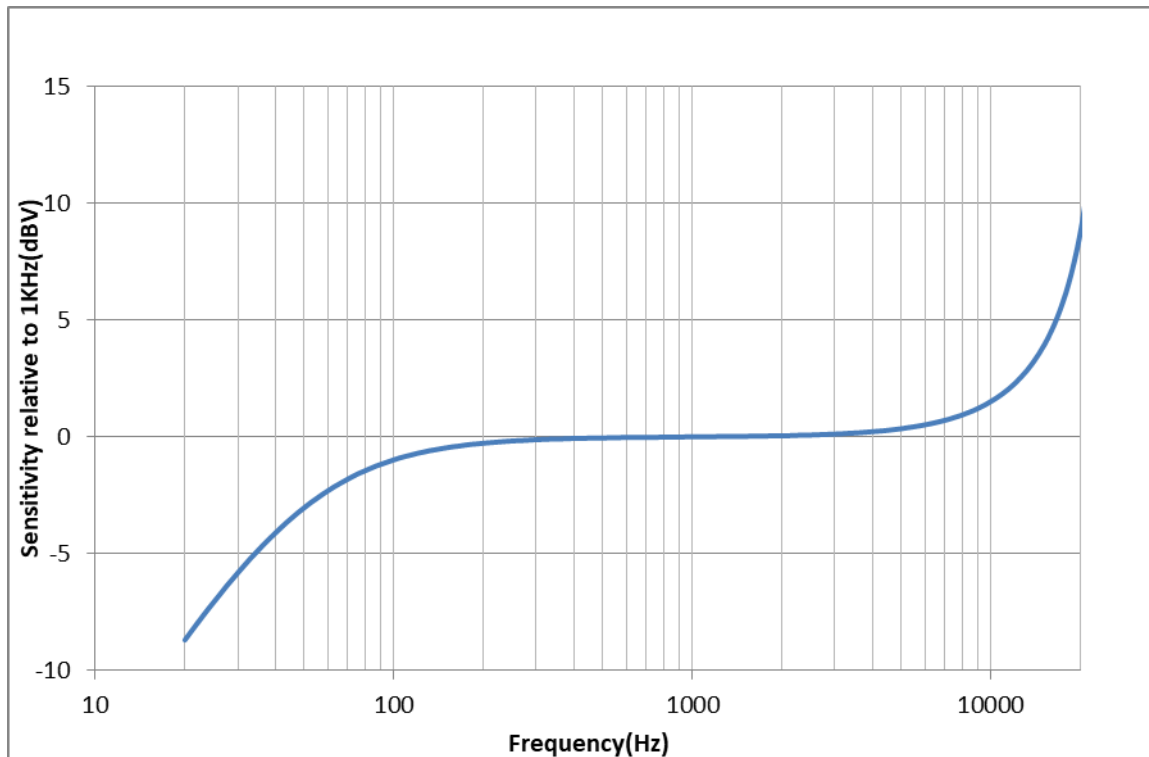
Unit: mm

Dimension tolerance is $\pm 0.15\text{mm}$ unless otherwise specified

Table 10.

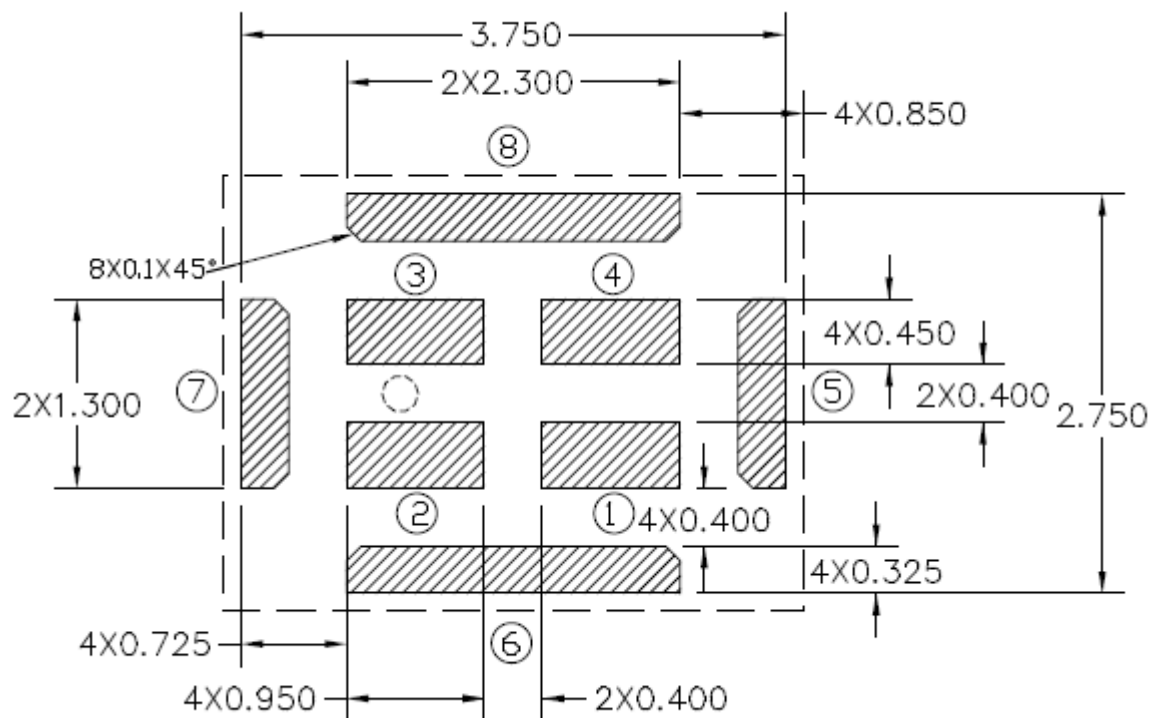
Pin #	Symbol	Type	Function
1	DATA	Digital O	Digital Output Signal
2	CLK	Digital I	Clock Input to Microphone
3	L/R	Digital I	Left(Low) / Right(High) Select pin
4	VDD	Power	Power Supply
5	GND	Power	Ground
6	GND	Power	Ground
7	GND	Power	Ground
8	GND	Power	Ground

Frequency Response



* Measured frequency of 1 kHz

PCB Land Pattern Layout



Application Circuit

The L/R digital pad lets the user to select the DATA signal pattern as explained in Table 6. The L/R pin must be connected to either VDD or GND.

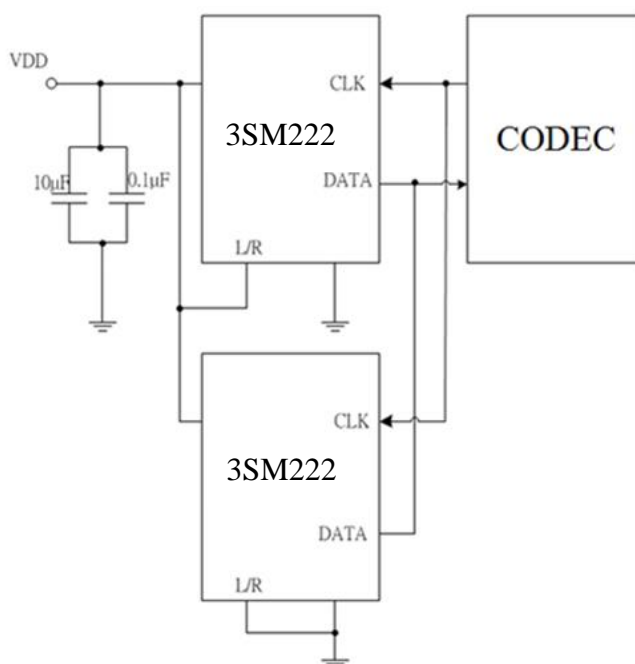
Table 11. L/R channel selection

L/R	CLK low	CLK high
GND	DATA valid	High impedance
VDD	High impedance	DATA valid

Single microphone application:

0.1 μ F ceramic, and 10 μ F ceramic power supply decoupling capacitors should be placed as near as possible to VDD of the device. **The L/R pin must be connected to VDD or GND** (refer to Table 7).

Two microphones application:

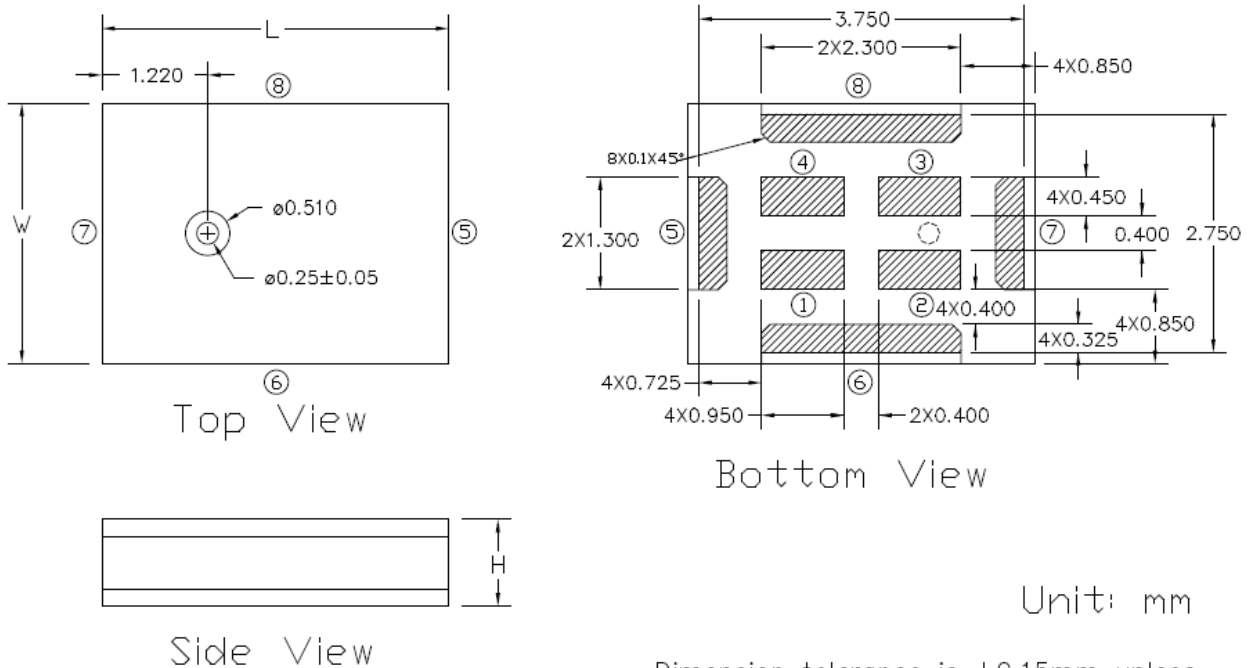


Handling Instructions

The MEMS microphone IC can be handled using standard pick-and-place and chip shooting equipment. Care should be taken to avoid damage to the MEMS microphone IC structure as follows:

- Do not apply vacuum nozzle over the acoustic port (AP) of the microphone to avoid damage to the device.
- Do not blow air directly into acoustic port.
- Brushing the board with/without solvents may damage the device.
- Do not use excessive force to place the microphone on the PCB.
- In case of manual handling, it should be handled with plastic tweezers to avoid damage the device.

Dimensions



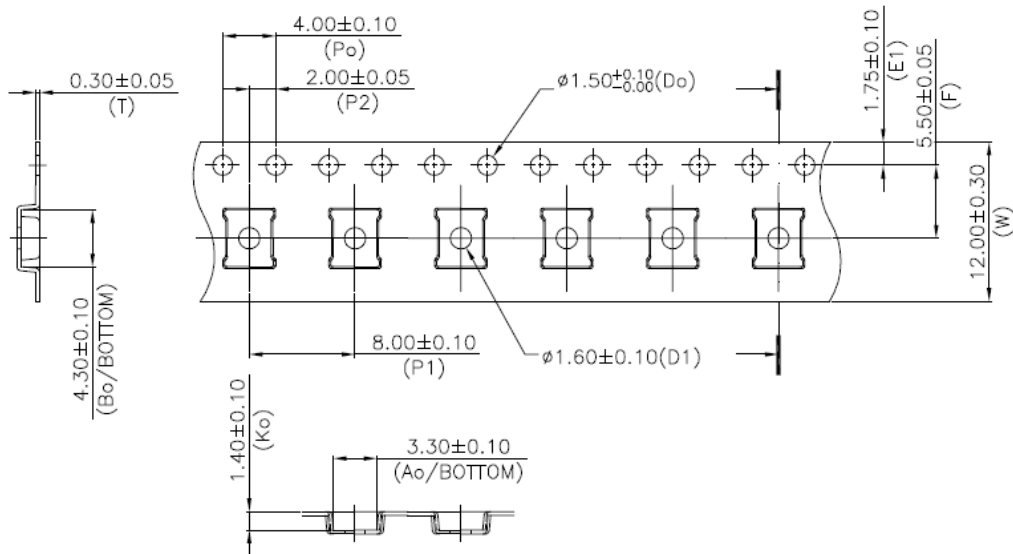
Dimension tolerance is ± 0.15 mm unless otherwise specified

Table 12. (Top View)

Item	Dimension	Tolerance
Length (L)	4.00 mm	± 0.10 mm
Width (W)	3.00 mm	± 0.10 mm
Height (H)	1.00 mm	± 0.10 mm
Acoustic Port	$\Phi 0.25$ mm	± 0.05 mm

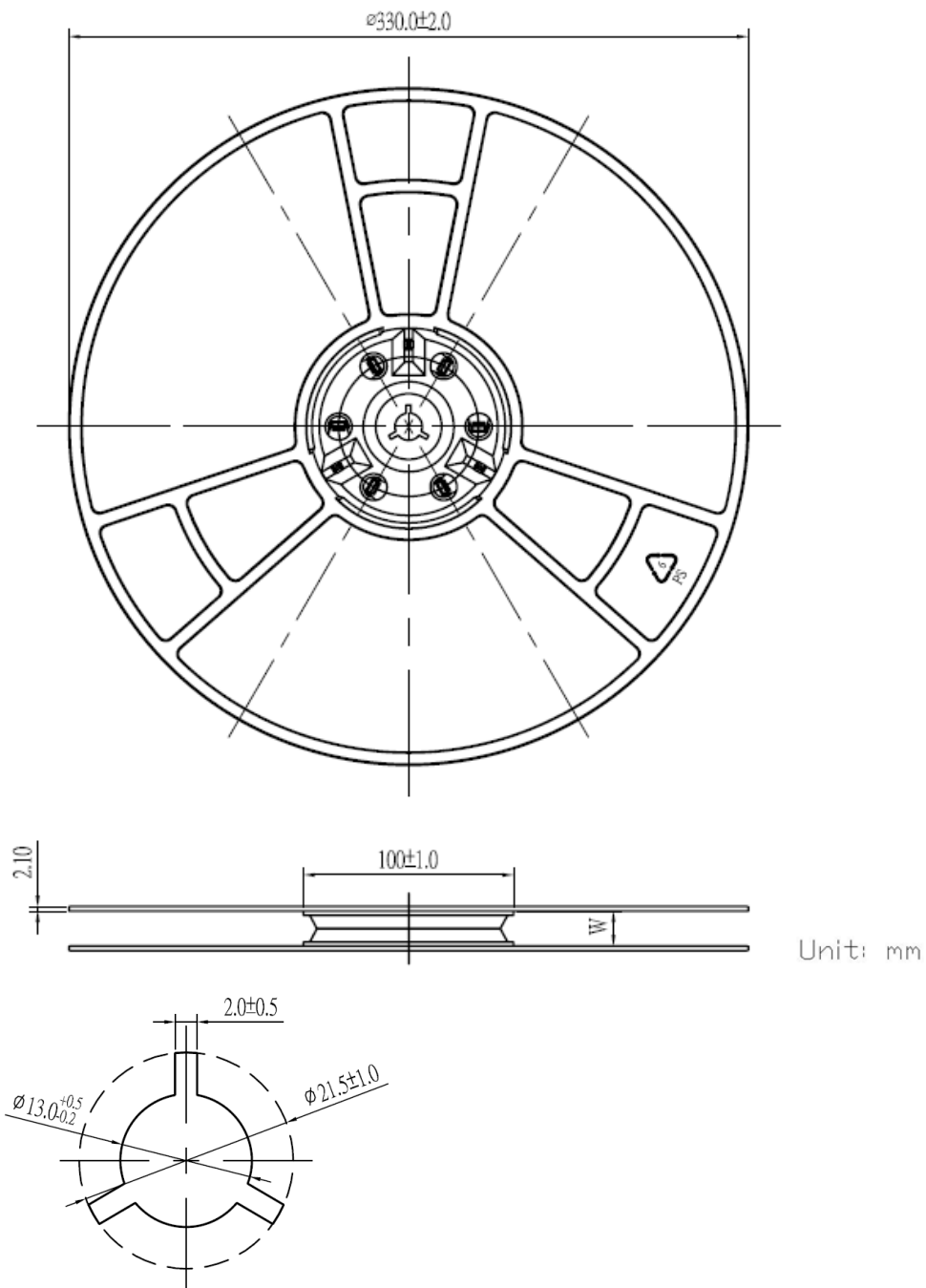
Package Information

Carrier Tape:



Unit: mm

1. 10 sprocket hole pitch cumulative tolerance ± 0.20 .
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy.
4. All dimensions meet EIA-481 requirements.
5. Thickness : 0.30 ± 0.05 mm.
6. MSL(Moisture sensitivity level) Class1.

13" Tape Reel :


Model Number	Reel Diameter	Quantity Per Reel
3SM222KMT1KA	13"	5,000

Revision History

Revision	Date	Description
1.0	2019/09/18	Formal release

单击下面可查看定价, 库存, 交付和生命周期等信息

[>>3S\(Solid state system\)\(鑫创科技\)](#)