

## **3SM127MZT1UA AEC-Q103 Qualified MEMS Microphone IC**

### **Product Description**

The *3SM127MZT1UA* microphone IC are integrated with specialized pre-amplification ASIC to provide high sensitivity, high SNR output from a capacitive audio sensor. It's packaged for surface mounting and high temperature reflow assembly. *3SM127MZT1UA* which is able to endure reflow temperature up to 260°C for 30 seconds can be used in SMT process. It is widely used in automotive and industrial electronics device.

### **Features**

- AEC-Q100/103 qualified
- Top port
- High stability - no risk of membrane aging
- Suitable for automatic pick-and-place handler and SMT process
- Miniature dimension 3.76mm x 2.95mm x 1.10mm
- Low current consumption 80uA
- RoHS/Green compliant
- Sensitivity deviation within  $\pm 1$ dB
- Package type : LGA 4-pin
- Omnidirectional

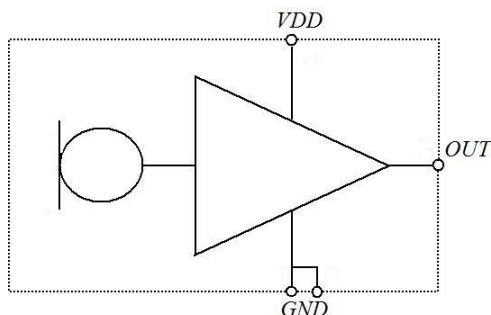
### **Applications**

- Automotive
- Industrial

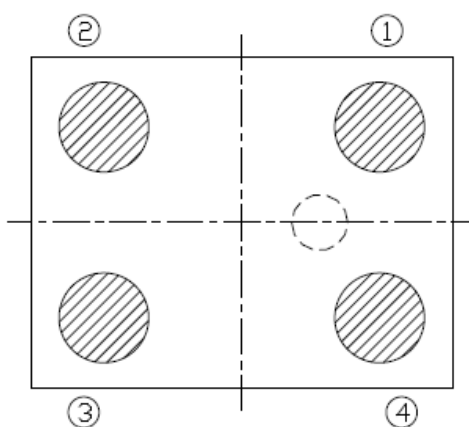
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## Functional Block Diagram



## Pin Definition and Function



Bottom View

Table 1

Pin #	Symbol	Function
1	VDD	Power supply
2	GND	Ground
3	GND	Ground
4	OUTPUT	Analog signal output

## Temperature Range

Table 2

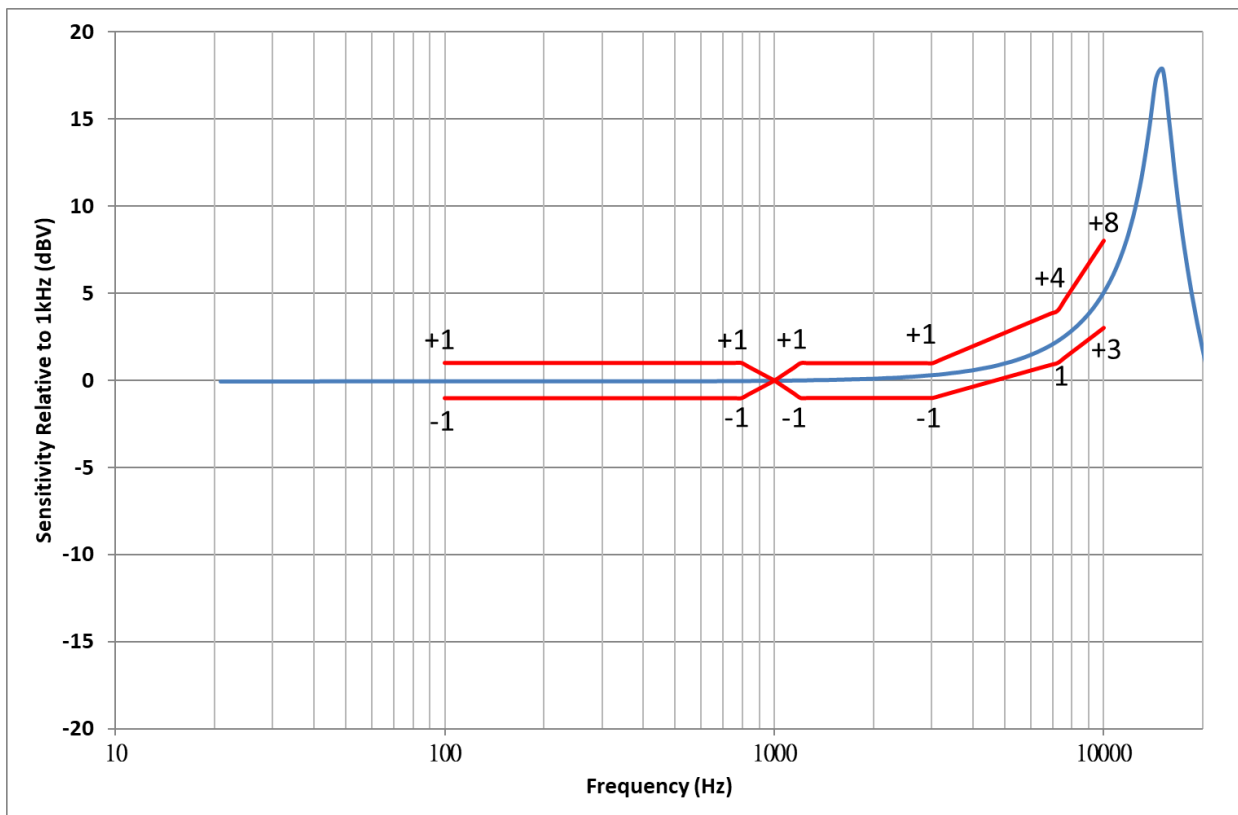
Storage Temperature	T <sub>STG</sub>	-40°C ~ 150°C
Operating Temperature Range	T <sub>A</sub>	-40°C ~ 125°C

## Acoustical and Electrical Characteristics

Table 3 Typical test conditions are  $T_A = 23\text{ }^{\circ}\text{C}$ ,  $V_{DD} = 2.1\text{ V}$  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
<b>Acoustic</b>						
Sensitivity	S	-39	-38	-37	dBV/Pa	1KHz, 94dB SPL
Signal to Noise Ratio	S/N		66		dB	A-weighted
Equivalent Noise Level	ENL		28		dB	A-weighted
Total Harmonic Distortion	THD		0.1		%	94dB SPL
			1		%	120dB SPL
Acoustic Overload Point	AOP		130		dB SPL	10% THD @ 1KHz, S = Typ.
Low Frequency Roll-off	LFRO		<20		Hz	-3dB relative to 1KHz
<b>Electrical</b>						
Supply Voltage	V <sub>DD</sub>	1.6		3.6	V	
Current Consumption	I <sub>sb</sub>		80		μA	V <sub>DD</sub> =2.1V
			80		μA	V <sub>DD</sub> =3.6V
Power Supply Rejection	PSR+N		-93		dBV(A)	217Hz, 100 mV peak to peak square wave on V <sub>CC</sub> 2.1V
Power Supply Rejection Ratio	PSRR		63		dB	1KHz, 200 mV peak to peak sine wave on V <sub>CC</sub> 2.1V
Output Impedance	Z <sub>out</sub>			200	Ω	@ 1KHz
Output DC Offset			1.3		V	
Directivity	Omnidirectional					
Polarity	Increasing Output Voltage					Increasing sound pressure

## Frequency Response



*Typical frequency response normalized to 1KHz (Measured)*

Upper Limit							
Hz	100	800	1000	1200	3000	7000	10000
dB ref. 1KHz	+1	+1	0	+1	+1	+4	+8
Lower Limit							
Hz	100	800	1000	1200	3000	7000	10000
dB ref. 1KHz	-1	-1	0	-1	-1	1	3

## Reliability Qualifications

Table 4

Test Item	Description	Standard	Result
High Temperature Operating Life	T <sub>A</sub> =125°C, V <sub>CC</sub> =3.6V, 1000hours	AEC Q100 Rev.H	PASS
Low Temperature Operation Life	T <sub>A</sub> =-40°C, V <sub>CC</sub> =3.6V, 1000hours	JESD22-A108	PASS
High Temperature Storage Life	T <sub>A</sub> =150°C, 1000hours	AEC Q100 Rev.H	PASS
Low Temperature Storage Life	T <sub>A</sub> =-40°C, 1000hours	JESD22-A119	PASS
Pre-Condition	Temperature cycling 5 cycles, Bake 24hrs, Moisture sock 168hrs, Reflow 3 cycles	JESD22-A113	PASS
Temperature Humidity Bias	T <sub>A</sub> =125°C, R.H.=85%, V <sub>CC</sub> =3.6V, 1000hours	AEC Q100 Rev.H	PASS
Thermal Cycling	T <sub>A</sub> =-55°C to 150 °C, 1000cycles	AEC Q100 Rev.H	PASS
Humidity & Temperature Cycle	+65°C/90%RH +45°C/95%RH -10°C , 5cycles	AEC Q103-003	PASS
Reflow	Peak temperature = 260°C, 5cycles	J-STD-020	PASS
Variable Frequency Vibration	Peak acceleration 20G, frequency = 20Hz to 2KHz, total 48min duration	AEC Q103-003	PASS
Mechanical Shock	Peak acceleration 10KG, 0.2ms pulse duration, 3 pulses/direction, 6 directions	JESD22-B104	PASS
Package Drop	10 drops on each of 6 faces (total 60 drops) from a high of 1.2m to concrete surface	AEC Q100 Rev.H	PASS
ESD	HBM : All pins, Test Voltage=±3KV	JESD22-A114	PASS
	MM : All pins, Test Voltage=±300V	JESD22-A115	PASS
	CDM : All pins, Test Voltage=±500V	JEDEC JS-002	PASS
	Air Discharge : Test Voltage=±15KV	IEC 61000-4-2	PASS
	Contact Discharge : Test Voltage=±8KV	IEC 61000-4-2	PASS
Latch-up	Class II, T <sub>A</sub> =105°C, I=±150mA	AEC Q100 Rev.H	PASS

Notes: Microphones meet all acoustic and electrical specifications before and after reliability testing, except sensitivity which can deviate up to 3dB from its initial value.

After 5 reflow cycles, the sensitivity of the microphone shall not deviate more than 1 dB from its initial value.

## Reflow Profile

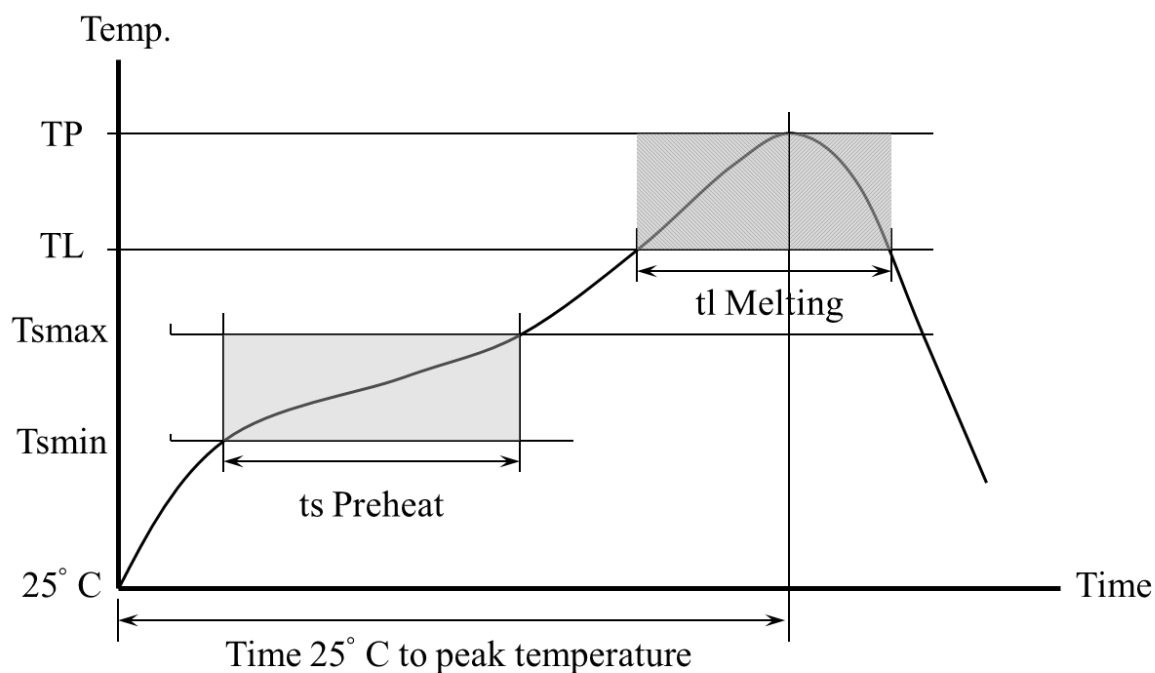


Table 5. Recommended Reflow Profile Limits

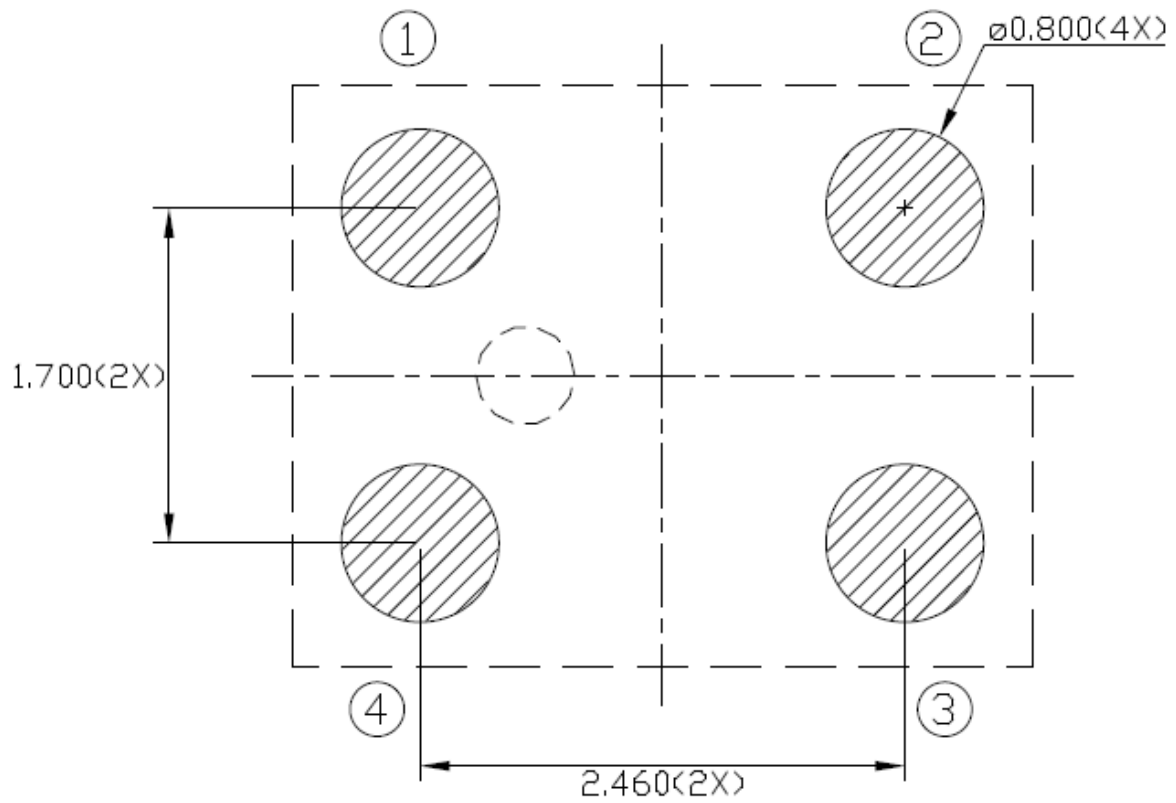
Profile Feature	Pb-free
Preheat	
Minimum temperature (Tsmmin)	150 °C
Maximum temperature (Tsmax)	200 °C
Time (ts)	60~180 sec
Average Ramp up rate (Tsmax to Tp)	3 °C/sec
Melting area	
Melting temperature (TL)	217 °C
Time maintained above melting (tl)	60~150 sec
Peak Temperature (TP)	260 °C
Time within 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

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

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

## PCB Land Pattern Layout

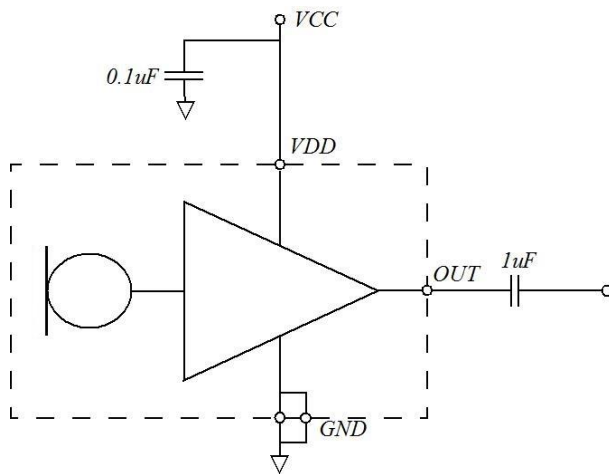
### Recommended Land Pattern





## Application Circuit

Typical Application:

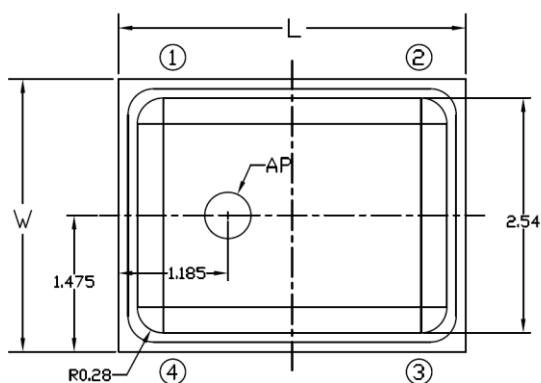


## Handling Instructions

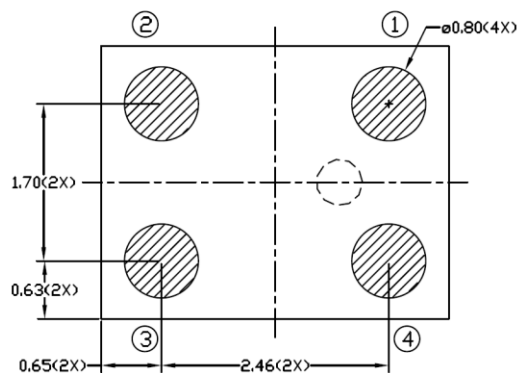
The MEMS microphone IC can be handled using standard pick-and-place and chip-shooting equipment. Care should be taken to avoid damage to the MEMS microphone IC structure as follows:

- 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. If air gun cleaning is required, the minimum distance is 10cm and the maximum air blow pressure is 30psi.
- 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 to the device.
- Do not open and remove IC from packaging until devices are ready to be mounted.
- Suggest PCB depaneling be done with depaneling cutter/router, or manually de-panel PCB with care and without any contact of MEMS Microphone IC.

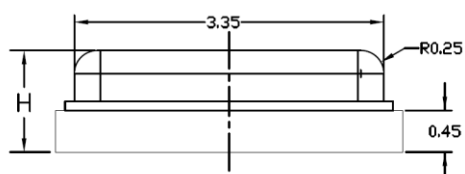
## Dimensions



Top View



Bottom View



Side View

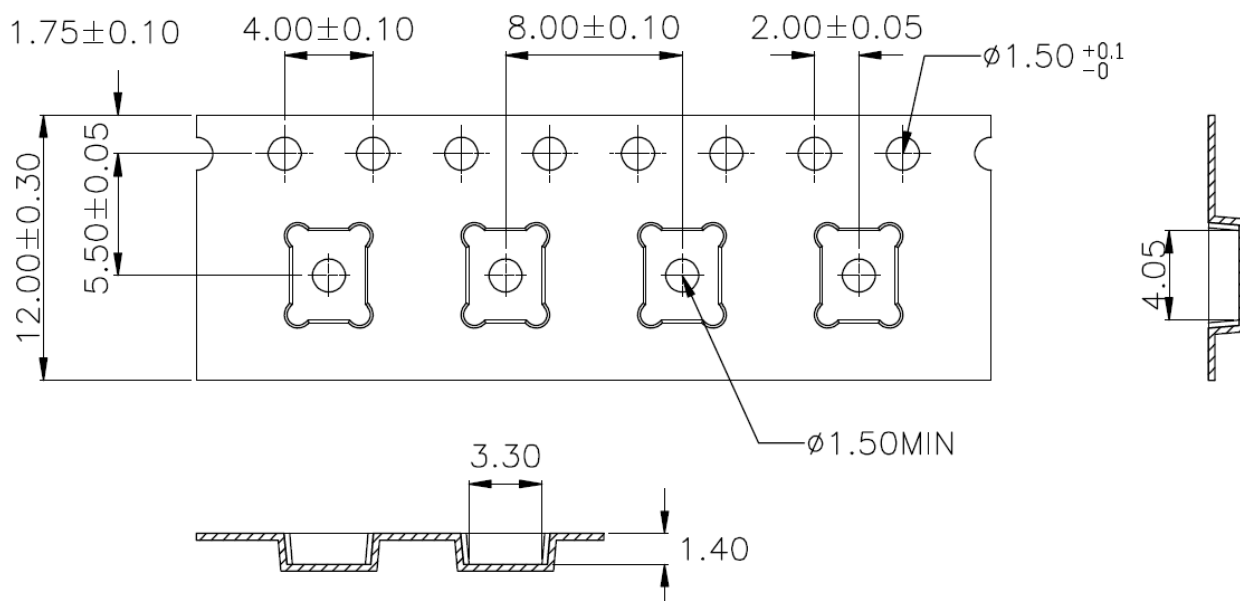
Unit: mm

Table 6(Top View)

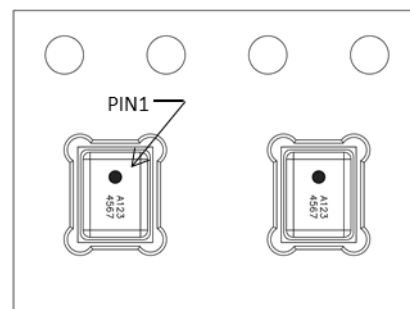
Item	Dimension	Tolerance
Length (L)	3.76 mm	±0.10 mm
Width (W)	2.95 mm	±0.10 mm
Height (H)	1.10 mm	±0.10 mm
Acoustic Port	Φ 0.5 mm	±0.05 mm

## Package Information

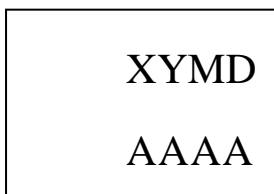
### Carrier Tape:



1. 10 sprocket hole pitch cumulative tolerance  $\pm 0.20$ .
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 :  $0.30 \pm 0.05$  mm.
6. MSL(Moisture sensitivity level) Class1.

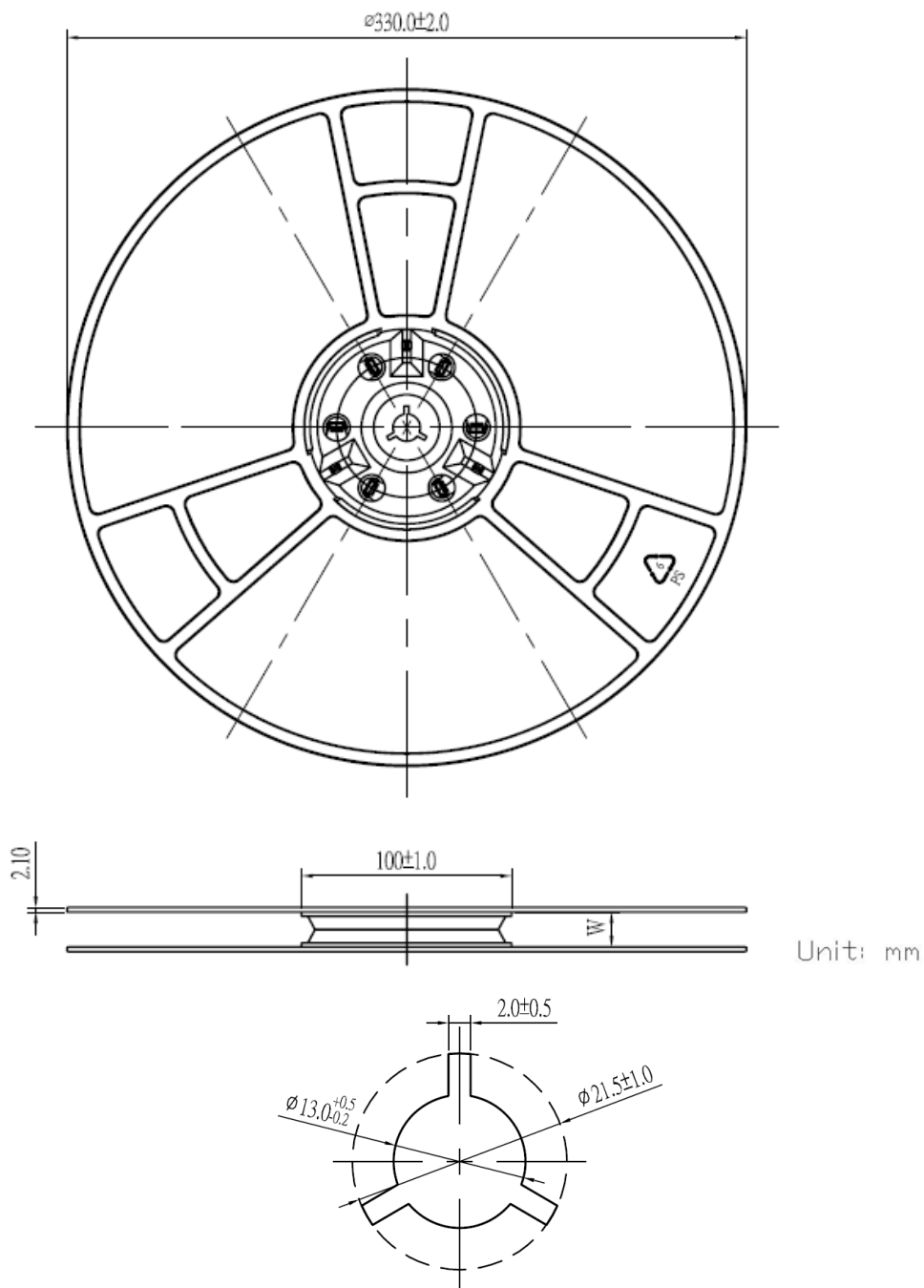


### Laser Marking:



### Laser marking on the top side

<b>XYMD</b>	<b>Internal Tracking Code(X:Subject to change without notice) Date Code(Y:Year; M:Month; D:Day)</b>
<b>AAAA</b>	<b>Lot Tracking Code</b>

**13" Tape Reel :**


Model Number	Reel Diameter	Quantity Per Reel
3SM127MZT1UA	13"	5,000

## Revision History

<b>Revision</b>	<b>Date</b>	<b>Description</b>
1.0	2020/12/25	Formal release
1.1	2021/01/07	Modify “Frequency Response”
1.2	2021/04/26	Modify “Reliability Qualifications” Modify “Package Information”
1.3	2021/08/03	Modify “Acoustical and Electrical Characteristics” Modify “Frequency Response”
1.4	2021/09/16	Modify “Reliability Qualifications”
1.5	2022/03/04	Modify “Reliability Qualifications”
1.6	2022/06/06	Modify “Features”
1.7	2022/06/29	Modify “Package Information”
1.8	2023/01/13	Modify “Frequency Response” Modify “Reliability Qualifications”