

***3SM121F4T1UE* MEMS Microphone IC**

Product Description

The *3SM121F4T1UE* 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. *3SM121F4T1UE* 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 telecommunication and electronics device such as headset, IoT device.

Features

- 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 ± 1 dB
- Package type : LGA 4-pin
- Omnidirectional

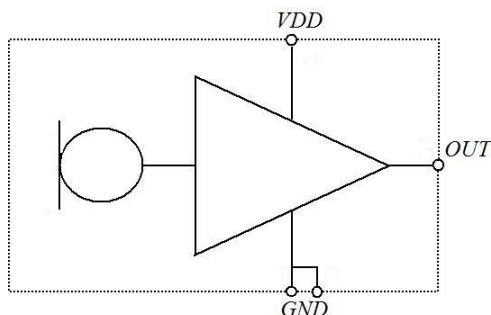
Applications

- TWS Headsets
- IoT Devices

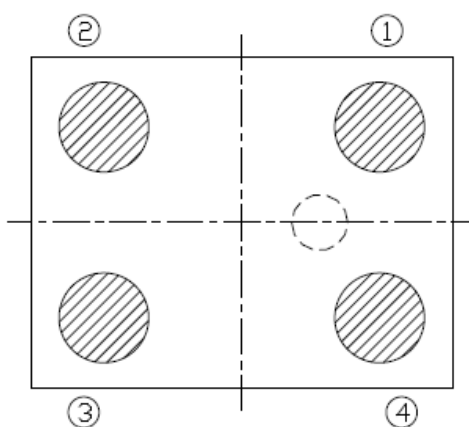
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Functional Block Diagram



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

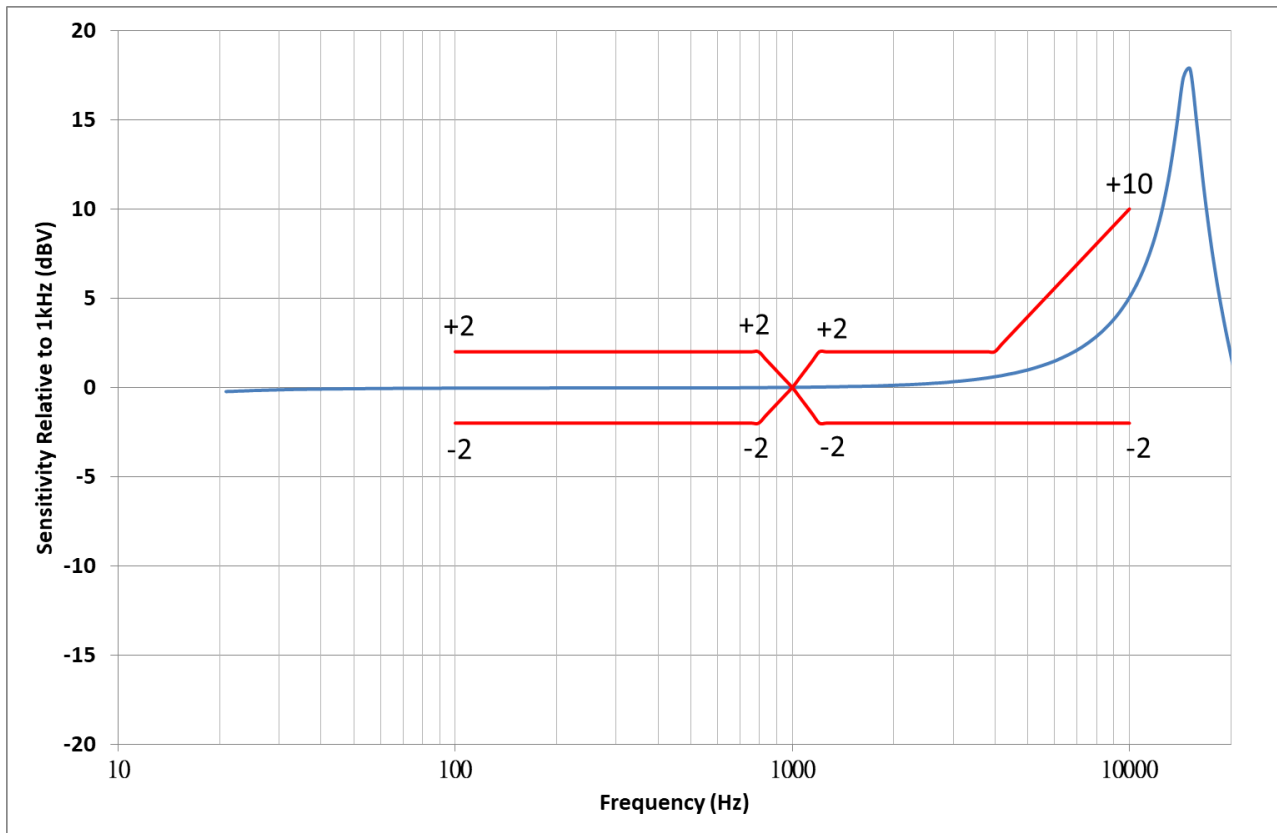
Storage Temperature	T _{STG}	-40°C ~ 125°C
Operating Temperature Range	T _A	-40°C ~ 105°C

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
Acoustic						
Sensitivity	S	-43	-42	-41	dBV/Pa	1KHz, 94dB SPL
Signal to Noise Ratio	S/N		60		dB	A-weighted
Equivalent Noise Level	ENL		34		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
Electrical						
Supply Voltage	V _{dd}	1.6		3.6	V	
Current Consumption	I _{sb}		80		μA	V _{dd} =2.1V
			80		μA	V _{dd} =3.6V
Power Supply Rejection	PSR+N		-93		dBV(A)	217Hz, 100 mV peak to peak square wave on V _{cc} 2.1V
Power Supply Rejection Ratio	PSRR		63		dB	1KHz, 200 mV peak to peak sine wave on V _{cc} 2.1V
Output Impedance	Z _{out}			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	4000	10000
dB ref. 1KHz	+2	+2	0	+2	+2	+10
Lower Limit						
Hz	100	800	1000	1200	4000	10000
dB ref. 1KHz	-2	-2	0	-2	-2	-2

Reliability Qualifications

Table 4

Test Item	Description
High Temperature Storage	Storage at 125°C for 1,000 hours JESD22-A103
Low Temperature Storage	Storage at -40°C for 1,000 hours JESD22-A119
High Temperature Operation Bias	Under Bias at 105°C for 1,000 hours JESD22-A108
Low Temperature Operation Bias	Under Bias at -40°C for 1,000 hours JESD22-A108
Temperature Humidity Bias	Under Bias at 85°C/85%RH for 1,000 hours JESD22-A101
Thermal Cycling Test	Thermal Cycle from -40°C~125°C, 100 cycles JESD22-A104
Reflow	5 reflow cycles with peak 260°C J-STD-020
Vibration	4 cycles lasting 12 minutes from 20 to 2KHz in X, Y and Z with peak acceleration of 20G JESD22-B103
Mechanical Shock	Total 18 pulses 10,000G in X,Y and Z JESD22-B104
ESD	HBM:3KV, MM:300V, CDM:500V Air Discharge:15KV, Contact Discharg:8KV JESD22-A114(HBM) JESD22-A115(MM) JESD22-C101(CDM) IEC 61000-4-2(Air Discharge) IEC 61000-4-2(Contact Discharge)

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

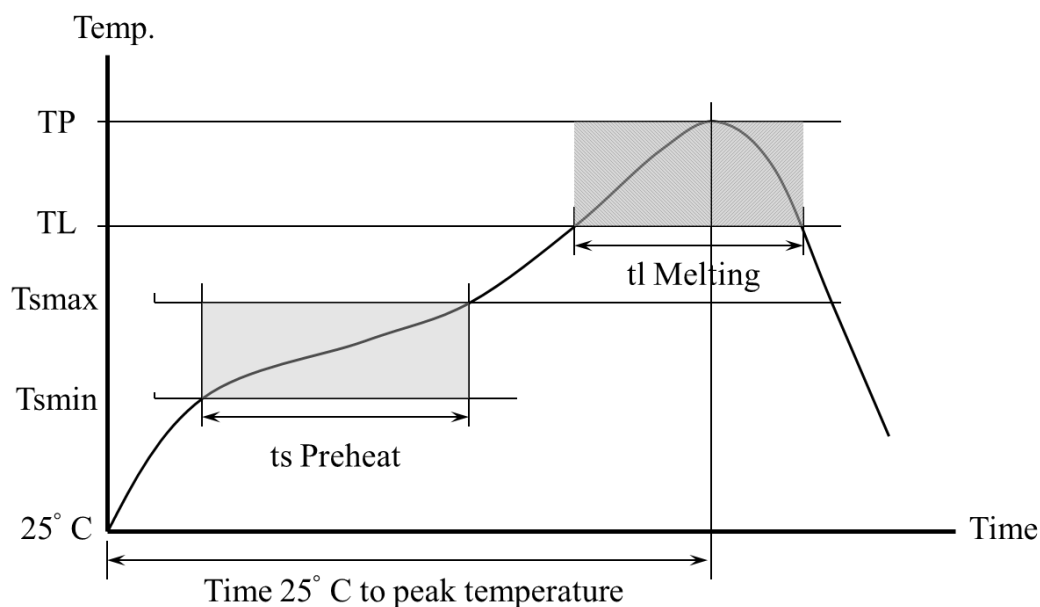


Table 5. Recommended Reflow Profile Limits

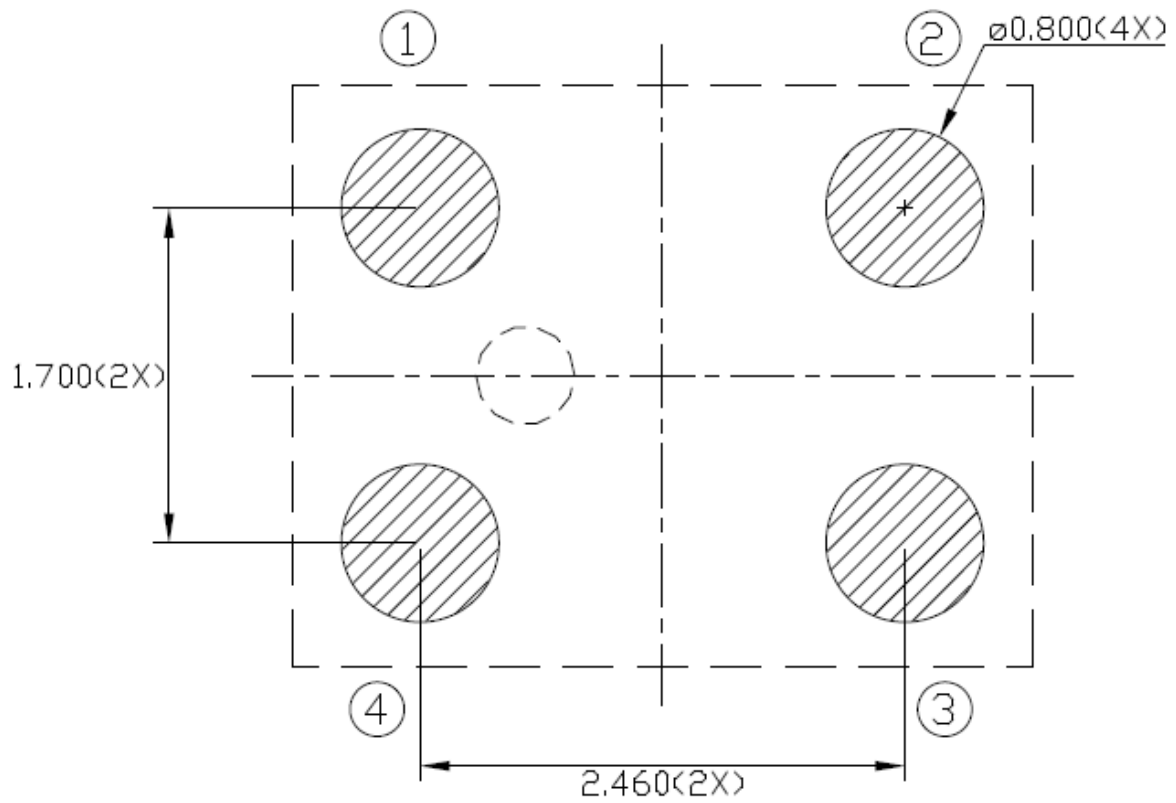
Profile Feature	Pb-free
Preheat	
Minimum temperature (Tsmmin)	150 °C
Maximum temperature (Tsmmax)	200 °C
Time (ts)	60~180 sec
Average Ramp up rate (Tsmmax to Tp)	3 °C/sec
Melting area	
Melting temperature (TL)	217 °C
Time maintained above melting (tl)	60~150 sec
Peak Temperature (TP)	260 °C
Time within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

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

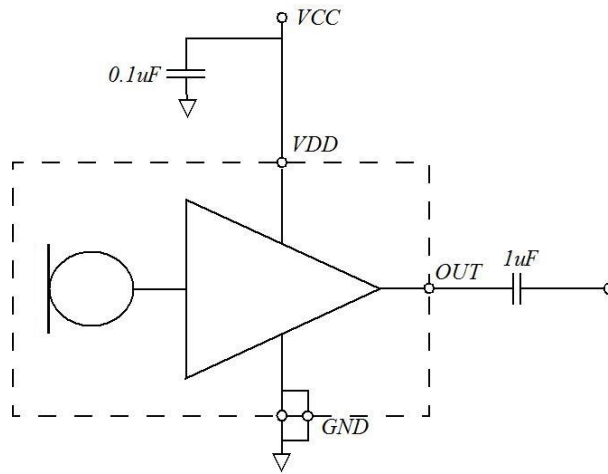
PCB Land Pattern Layout

Recommended Land Pattern



Application Circuit

Typical Application:

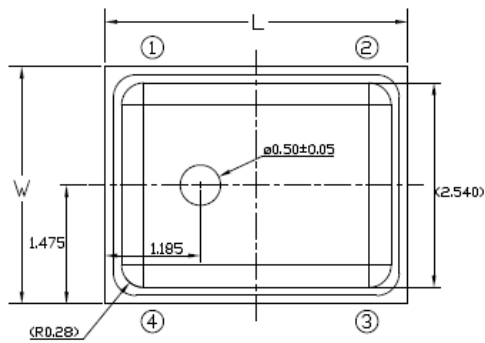


Handling Instructions

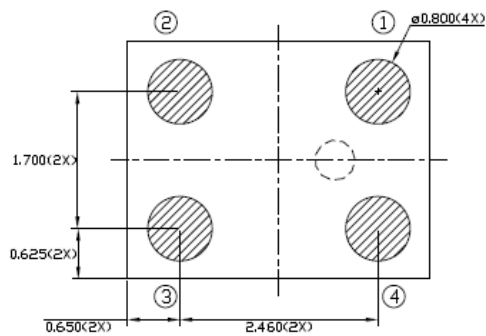
The MEMS microphone IC can be handled using standard pick-and-place and chip-shooting equipment. Care should be taken to avoid damage to the MEMS microphone IC structure as follows:

- 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

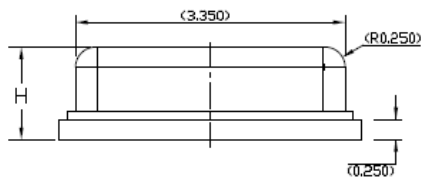


Top View



Bottom View

Unit: mm



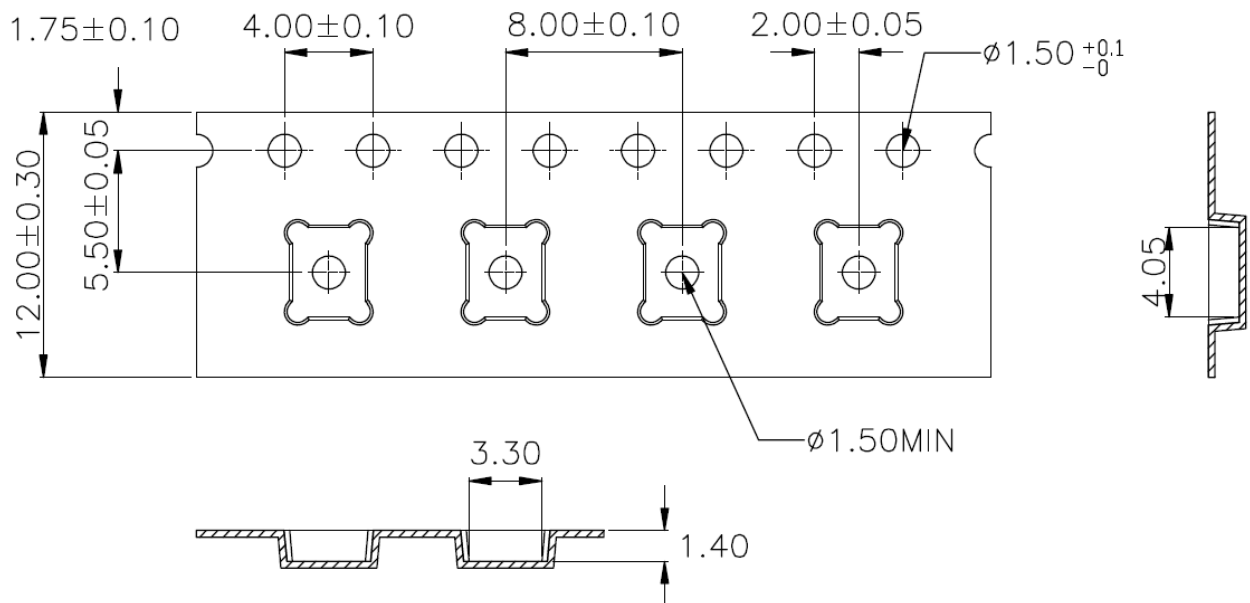
Side View

Table 6(Top View)

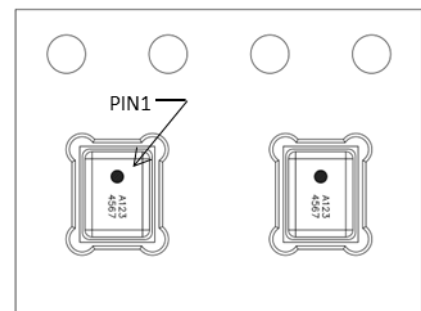
Item	Dimension	Tolerance
Length (L)	3.76 mm	±0.10 mm
Width (W)	2.95 mm	±0.10 mm
Height (H)	1.10 mm	±0.10 mm
Acoustic Port	Φ 0.5 mm	±0.05 mm

Package Information

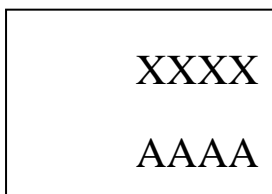
Carrier Tape:



1. 10 sprocket hole pitch cumulative tolerance ± 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.

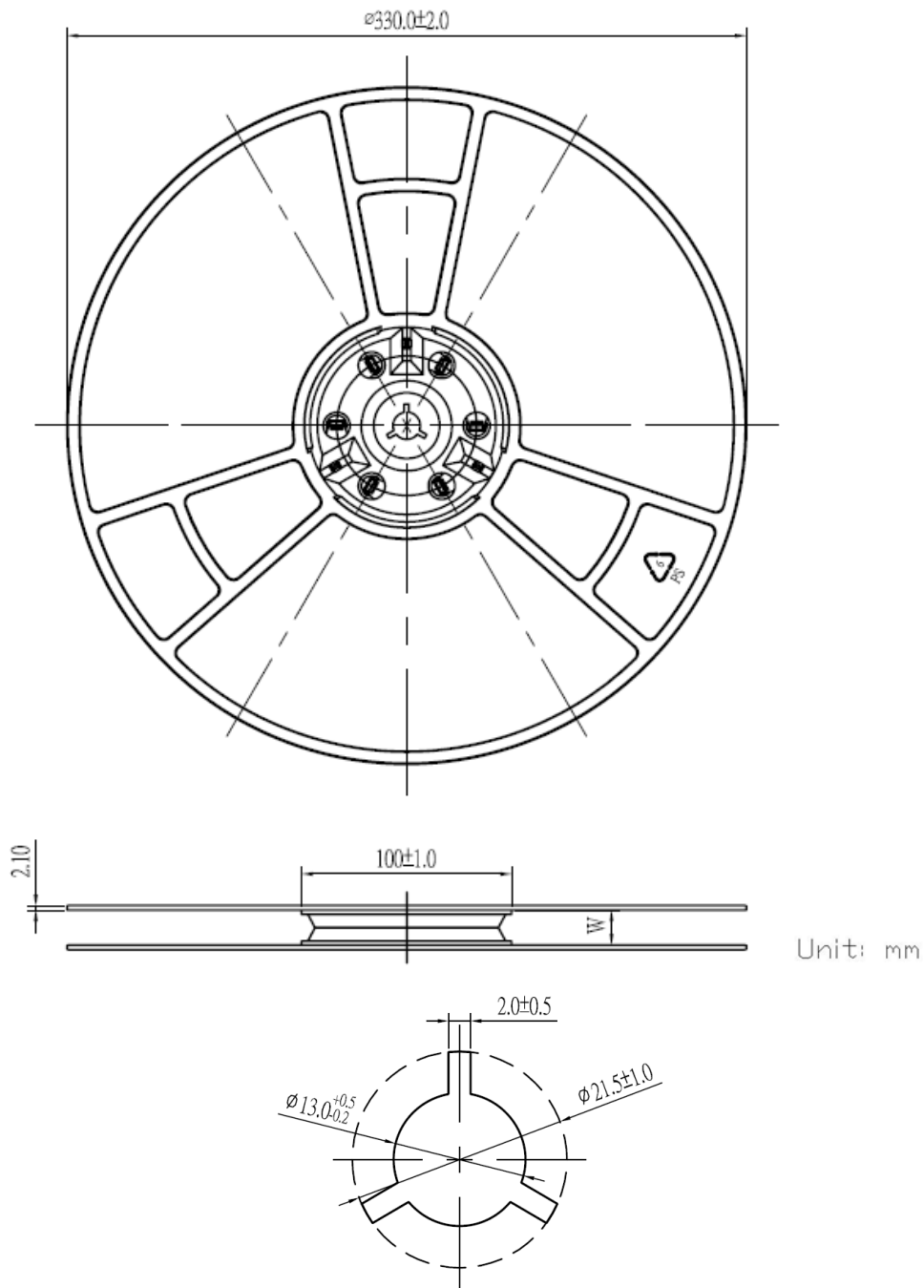


Laser Marking:



Laser marking on the top side

XXXX	Internal Tracking Code
AAAA	Lot Tracking Code

13" Tape Reel :


Model Number	Reel Diameter	Quantity Per Reel
3SM121F4T1UE	13"	5,000

Revision History

Revision	Date	Description
1.0	2021/08/25	Formal release
1.1	2022/06/29	Modify "Package Information"
1.2	2023/04/19	Modify "Reliability Qualifications" Modify "Package Information"