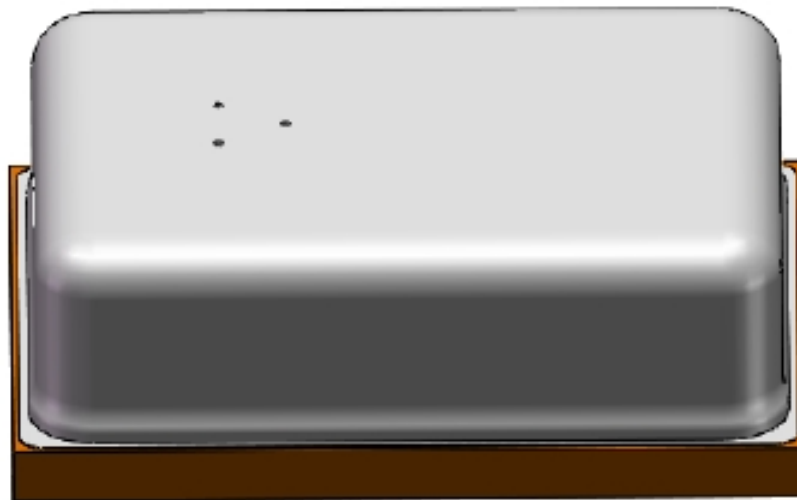


SDV01-003

Bone Sensor

Product Datasheet



Index

- 1. Introduction 4
- 2. Maximum rated parameters 4
- 3. Testing Conditions 5
- 4. Characteristics 5
 - 4.1 Electrical specification parameter table 5
 - 4.2 Digital interface specification 6
- 5. Mechanical Parameters 8
 - 5.1 Pin Configuration 8
 - 5.2 Outline Dimensions 8
- 6. Storage and Transportation 9
- 7. Cautions 9
- 8. PCB Design and Reflow Soldering 9
- 9. Package Specifications 12
 - 9.1 Tape Specifications 12
 - 9.2 Reel Specification 13
 - 9.3 The content of Box 13
 - 9.4 Packing Explain 14

1. Introduction

SDV01-003 is a high performance, digital Bone sensor optimized for picking-up people's voice through bone vibration, which achieves a better signal with high SNR and shields the normal ambient sound noise.

Key features

Package: 5-pin LGA package, 3.5mm x 2.65mm x 1.3mm
Pb-free, halogen-free and RoHS compliant

Performance

PDM digital signal output
Supply voltage: 1.62 ... 3.6V (VDD)
High sensitivity: -11 +3/-2 dBFS/g
High SNR: 75dB
It is more suitable for picking up voice signals in the ear canal
Reflow Solderable (up to 260°C high temperature reflux)

Applications

Wearable/hearable devices
Communication in noisy/challenging types of environments
Hearing aids
Bone Joint Monitor in health prediction field
Mechanical Joint Monitor and device conditioning
Structure Health Monitor

2. Maximum rated parameters

Table 1: Absolute maximum rating

parameters	condition	Min	Max	Unit
Storage Temperature		-40	+85	°C
Supply Voltage	All pins	-0.3	+3.6	V
ESD level	HBM,R=1.5kohm,C=100pF		±2	kV
Maximum impact acceleration	All direction		10000	g

3. Testing Conditions Maximum rated parameters

Table 2: Testing Condition (Vent Hole Sealed)

Test Conditions	Temperature	Humidity	Air Pressure
Standard Conditions	+15~+35℃	25%RH~75%RH	860hPa~1060hPa
Judgment Conditions	+20±2℃	40%RH~50%RH	860hPa~1060hPa

4. Characteristics

4.1 Electrical specification parameter table

Testing Conditions: TA=20±2℃, Room Humidity = 60±5%, Vdd=1.8V

Table 3: Parameter List

Parameters	Symbol	Condition	Min	Typical	Max	Unit
Supply Voltage	V		1.62	1.8	3.6	V
Noise Density	N_ density	@250Hz			6	ug/vHz
		@1kHz			3	ug/vHz
		@2kHz			2	ug/vHz
Sound isolation		94dB SPL, @100Hz	40			dB
		94dB SPL, @1kHz	30			dB
Standby current	I _{sleep}	CLK=off or CLK<1kHz		<1	35	uA
F _{clock} =768KHz, Decimation Rate =48x, Low Power Mode						
Current	I _{dd}	Output load <5pF		310		uA
Sensitivity	S	1g acceleration, @1kHz	-13	-11	-8	dBFS/g
Signal to noise ratio	SNR	BW=100~3kHz, A-weighted		75		dB(A)
Acceleration Level		<10% THD @ 1kHz		±6		g
F _{clock} =2.4MHz, Decimation Rate =64x, Normal Mode						
Current	I _{dd}	Output load <5pF		890		uA
Sensitivity	S	1g acceleration, @1kHz	-29	-27	-24	dBFS/g
Signal to noise ratio	SNR	BW=100~3kHz, A-weighted		75.5		dB(A)
Acceleration Level		<10% THD @ 1kHz		±15		g

4. 2 Digital interface specification

Testing Conditions: TA=20±2 °C, Room Humidity = 60±5%, Vdd=1.8V, No-load test of working current and digital sequence.

Table 4: Parameter List

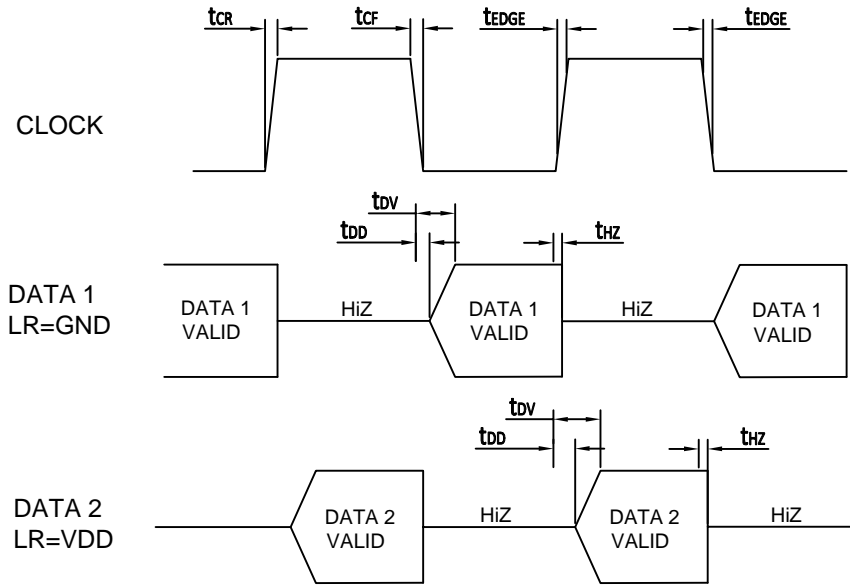
Parameters	Symbol	Condition	Min	Typical	Max	Unit	Remarks
Data Format	1/2 Cycle PDM						
Clock Frequency Range	Fclk	Standby Mode			350	KHz	
		Low Power Mode	450	768	850	KHz	
		Normal Mode	1.38	1.536	1.7	MHz	
			2.1	2.4	2.6	MHz	
		High Performance Mode	2.9	3.072	3.3	MHz	
			4.5	4.8	5.1	MHz	
Clock Duty Cycle			45		55	%	Fclk <=2.65MHz
			48		52		Fclk >=2.9MHz
Clock Rise Time	Tcr				13	ns	
Clock Fall Time	Tcf				13	ns	
Input Logic High	VIH		0.65Vdd		Vdd+0.3	V	
Input Logic Low	VIL		-0.3		0.35Vdd	V	
Output Logic High	VOH		0.7Vdd			V	
Output Logic Low	VOL				0.3Vdd	V	
Delay Time For Data Driven	Tdd	Cload=max, Clock=768kHz	40		80	ns	
Delay Time For Data Valid on Rising/Falling Clock Edge	Tdvr / Tdvf				100	ns	
Delay Time for High-Z	Tdz		5		30	ns	
Short Circuit Current	Is		1		20	mA	
Driving Capability	Cload				100	pF	

Remark 1. Current consumption depends on the clock frequency applied to the CLK terminal and the load of the DATA output terminal.

Remark 2. dBFS = 20xlog (A/B) Where A is the signal level and B is the level corresponding to the full-scale level.

Remark 3. Clock: input port related interface characteristics, chip design to ensure that meet;

Block diagram:



Response Curve:

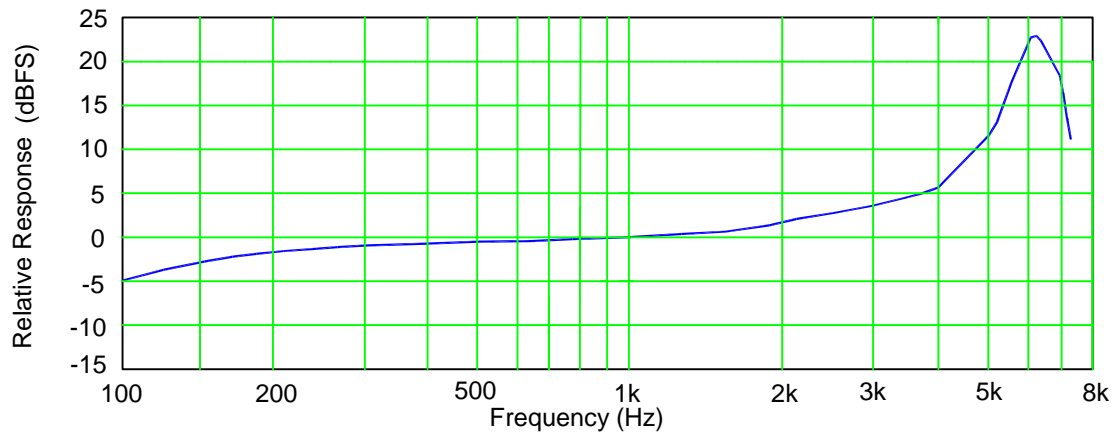


Figure 1: Frequency Response Curve

5. Mechanical Parameters

5.1 Pin Configuration

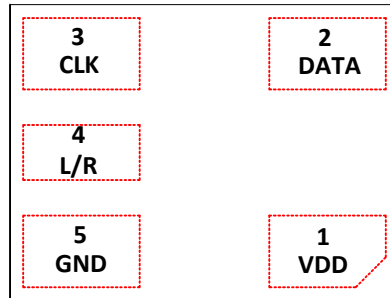


Figure 2: Layout pin configuration SDV01-003
(Top View, PAD not visible)

Table 5: SDV01-003 Pin Configuration

Pin	Name	Function
1	VDD	Power Supply
2	DATA	Data signal I/O interface
3	CLK	CLK signal I/O interface
4	L/R	L/R
5	GND	Digital ground

5.2 Outline Dimensions

The sensor housing is a 5 Pin LGA package with metal lid. Its dimensions are 3.5mm (± 0.1 mm) x 2.65mm (± 0.1 mm) x 1.3mm (± 0.1 mm). Tolerance is ± 0.1 mm unless otherwise specified.

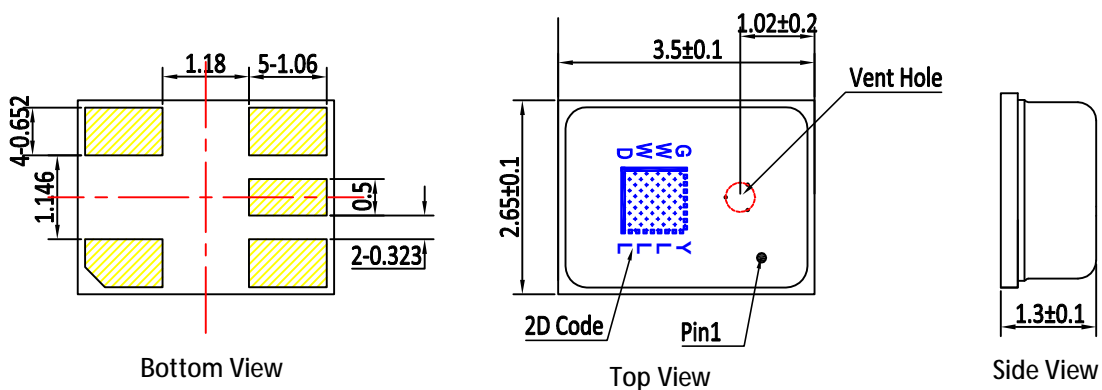


Figure 3: SDV01-003 outline and size

6. Storage and Transportation

Keep in warehouse with less than 75% humidity and without sudden temperature change, acid air, any other harmful air or strong magnetic field.

The sensor with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during transportation.

Storage Temperature Range: $-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$

Operating Temperature Range: $-30^{\circ}\text{C} \sim +70^{\circ}\text{C}$

7. Cautions

Vent Hole Protection

During reflow soldering, it is forbidden to block the vent holes of the product, so as to avoid damage to the product packaging caused by high temperature during the reflow process.

After reflow process, it is recommended to seal the vent hole with Mylar membrane or UV glue, to prevent particle and improve sensitivity loss.

Products that block the vent are not recommended for high temperature processing to avoid internal gas expansion, which affects the plugging effect and internal air pressure.

Liquid Washing Restriction

It is forbidden to wash the device with liquid, such as water, alcohol etc., otherwise this could damage the device.

Nozzle Restriction

It is very important not to pull a nozzle over the vent hole, otherwise this could damage the device.

8. PCB Design and Reflow Soldering

Land Pattern Recommendation

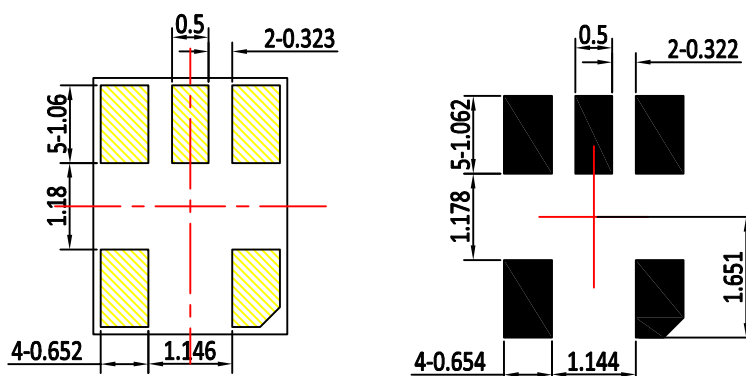


Figure 4: PCB Layout Pattern (Left), Solder Paste Stencil Pattern (Right)

Nozzle and Picking Area

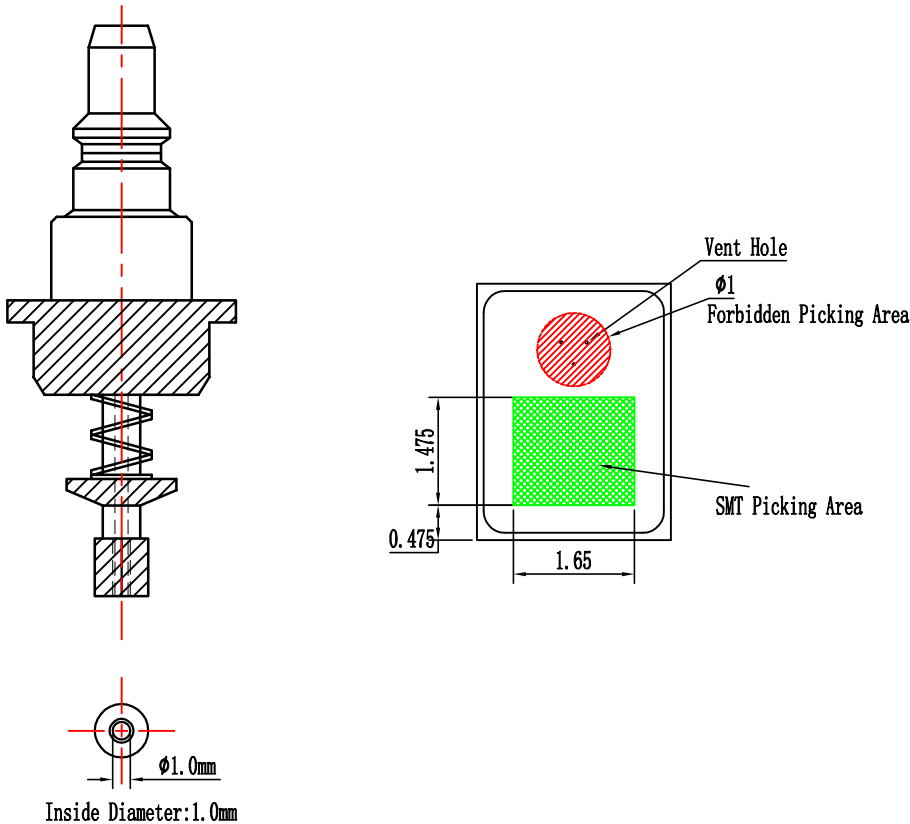
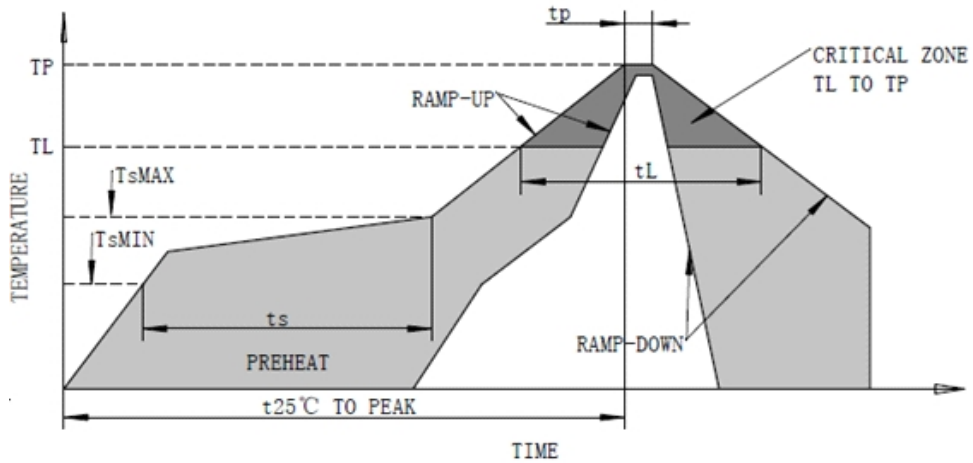


Figure 5: SMT Nozzle Dimension (Left), Picking Area Drawing (Right)

Soldering Recommendation

Temperature Control	8 zones
Heater Type	Hot Air
Solder Type	Lead-free

Soldering Profile



Profile Feature	Pb-Free Assembly
Average ramp-up rate(TsMAX to TP)	2.5°C/seconds max.
Preheat	
-Temperature Min.(TsMIN)	150°C
-Temperature Max.(TsMAX)	200°C
-Time(TsMIN to TsMAX)(Ts)	120~180 seconds
Time maintained above:	
-Temperature(TL)	217°C
-Time(tL)	Max 80 seconds
Peak temperature(TP)	260°C
Time within 5°C of actual peak temperature(TP)2	Max 50 seconds
Ramp-down rate	-5°C/seconds max.
Time 25°C to peak temperature	8 minutes max.

9. Package Specifications

9.1 Tape Specifications

Quantity per reel: 4000pcs.

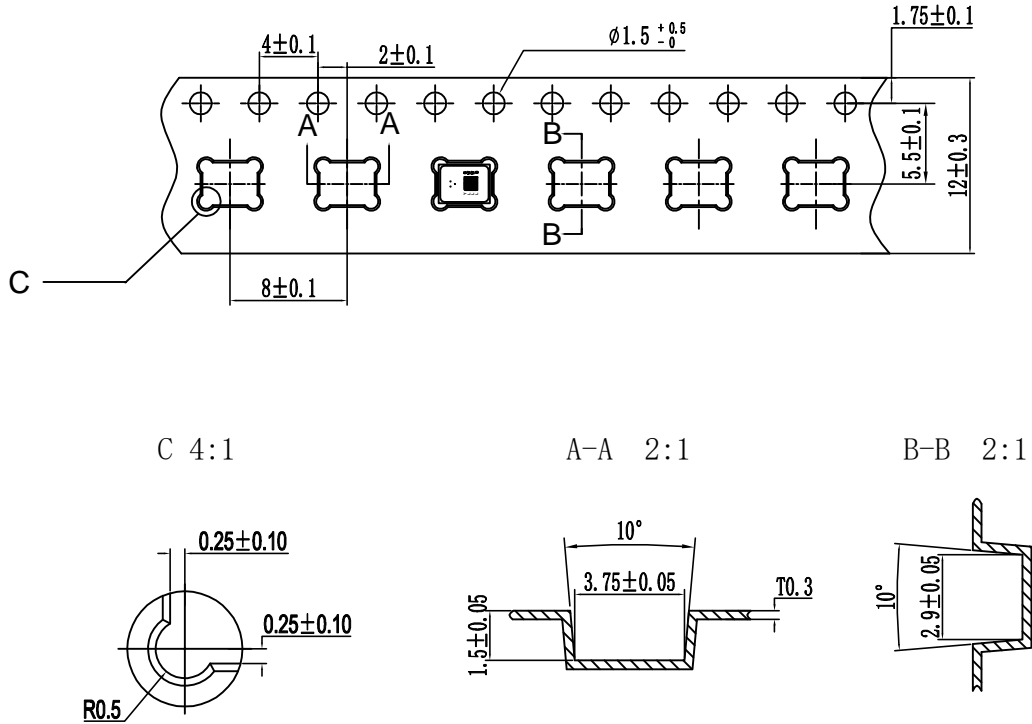


Figure 6: Tape Information (Unit: mm)

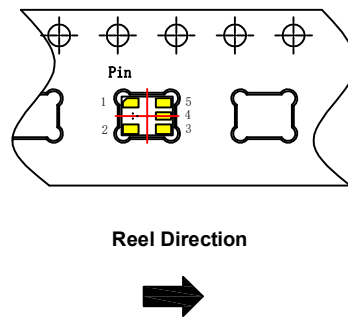
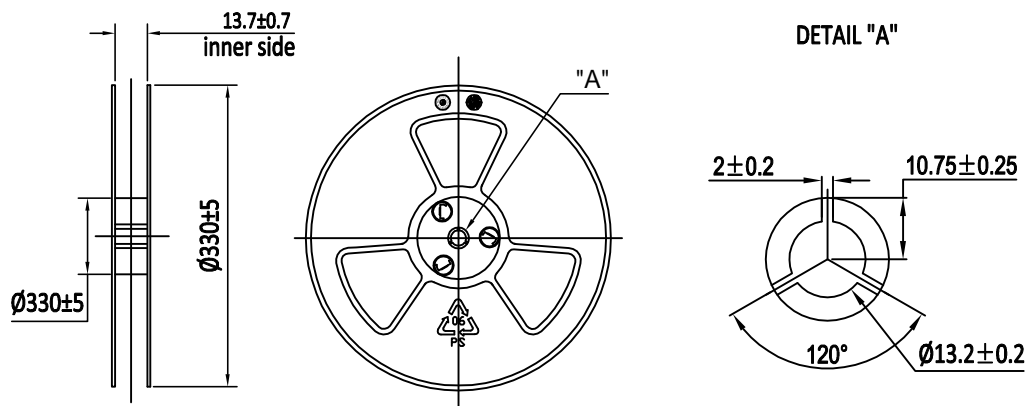


Figure 7: Pin Information

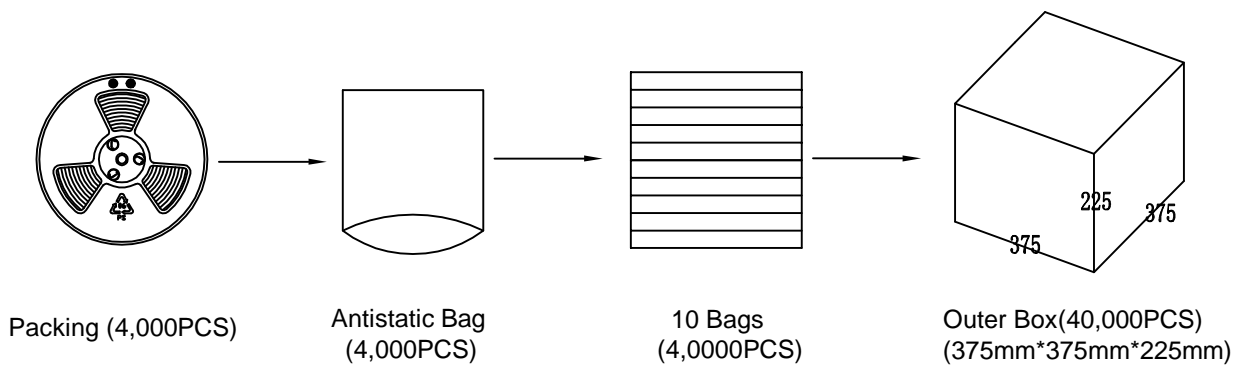
9.2 Reel Specification

13" reel will be provided for mass production stage and sample stage more than 1000pcs

13" Reel Specification (Unit: mm)

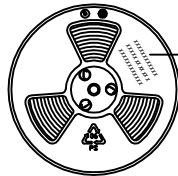


9.3 The content of Box



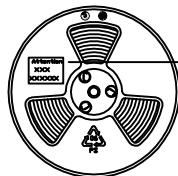
9.4 Packing Explain

The Label Content of the Reel



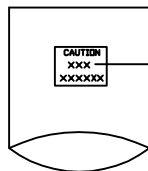
The Content Includes:
RoHS+HF, MSL: ;
Product type, Lot, Customer P/N;
and other essential information such as
Quantity, Date etc.

The Label Content of ESD Caution



ESD Caution Label

The Label Content of Moisture Caution



MSL 1 Caution Label