增 益 实 业

# 零 件 承 认 书

SPECIFICATION FOR APPROVAL

客户名称: 0110

客户料号：

增益型号：

规格描述： ZEMS404012 小一体成型电感系列规格书

日　　期: 2022/05/08

版　　本: A

增益签核:

| 制订 | 审核 | 核准 |
|---|---|---|
| 夏琳 | | 李万 |

客户签核:

| 工程 | 审核 | 核准 |
|---|---|---|
| | | |

东莞市增益实业有限公司
地址：东莞市塘厦镇林村塘厦大道北552号
电话：0769-87321000
传真：0769-87891229

| 物料类型： | 小一体成型电感 |
|---|---|
| 日　　期: | 2022/05/08 |
| 版　　本: | A |
| | |

## ◆特征： Features:

1.1 Metal material for large current and low loss.

1.2 High performance (Isat) realized by metal dust core.

1.3 Low loss realized with low Rdc.

1.4 Closed magnetic circuit design reduces leakage flux.

1.5 Vinyl thermal spray, better surface compactness.

1.6 Environmental requirements must comply with the QESP-44 document

1.7 100% lead (Pb) free meet RoHS2.0 and Halogen，
Reach and other legal and regulatory requirements standard.

## ◆用途： Applications:

2.1 DC/DCconverters.

2.2 Pad,Smartphone.

2.3 Portablegamingdevices,Smartwear,Wi-Fimodule.

2.4 Notebooks,VR,AR.

2.5 LCDdisplays,HDDs,DVCs,DSCs,etc.

2.6 Basebandpowersupply,Amplifier,Powermanagement,
Modulepowersupply,Camerapowermanageme.

## ◆产品型号： ProductIdentification：

| ZEMS | 4040 | 12 | - | 1R0 | M |
|---|---|---|---|---|---|
| ① | ② | ③ | | ④ | ⑤ |

①Series Name: Mini Molding Power Inductors

②External Dimensions(L×W):4040=4.1*4.1 mm

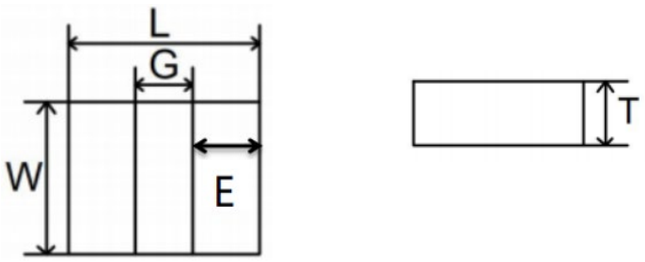
③External Dimensions(H):12=1.2 mm

④Inductance value:1R0=1.0uH

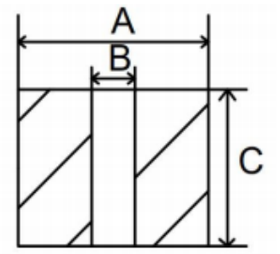
⑤Tolerance:M=±20%

## ◆产品外观尺寸： ShapeandDimensions(dimensionsareinmm)：

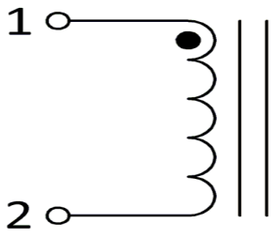
### Outline Dimensions




### Recommend Land Pattern Dimensions



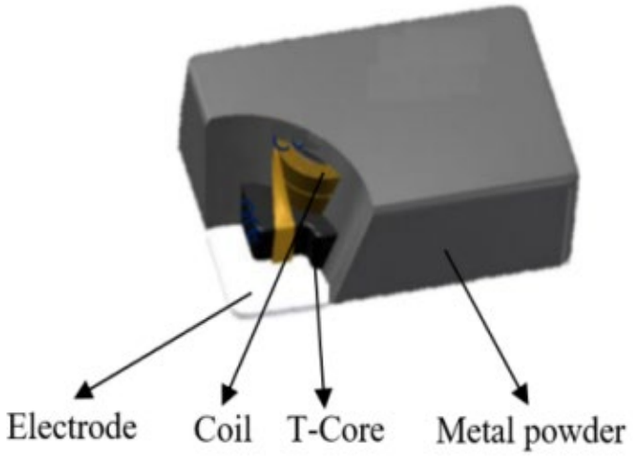

### SCHEMATIC




Units:mm

| Series | L | G/Typ | W | E | T | A/Typ | B/Typ | C/Typ |
|---|---|---|---|---|---|---|---|---|
| ZEMS404012 | 4.1±0.2 | 1.3±0.2 | 4.1±0.2 | 1.40±0.2 | 1.20Max. | 4.10 | 1.10 | 4.10 |

## ◆产品构造： Material List




## ◆环境： EnvironmentalData:

●工作温度：-55℃至+125℃
（包括线圈自身温升）

●OperatingTemperature:-55℃ to+125 ℃(Includingcoilsself-temperaturerise)

## Electrical Characteristics电气性能

# ZEMS404012 Series

| P/N | L0(μH) @(0A)1MHz | Rdc(mΩ) | | Heat rating current | | Saturation current | |
|---|---|---|---|---|---|---|---|
| | | Typical | Max | Typical | Max | Typical | Max |
| ZEMS404012-R47M | 0.47 | 11.50 | 14.00 | 9.20 | 8.70 | 12.20 | 11.70 |
| ZEMS404012-R68M | 0.68 | 15.00 | 18.00 | 8.70 | 7.70 | 10.20 | 9.20 |
| ZEMS404012-1R0M | 1.00 | 21.00 | 25.00 | 6.50 | 5.70 | 11.20 | 10.20 |
| ZEMS404012-1R5M | 1.50 | 29.00 | 34.50 | 6.20 | 5.20 | 8.20 | 7.20 |
| ZEMS404012-2R2M | 2.20 | 45.00 | 55.00 | 5.20 | 4.70 | 6.70 | 6.20 |
| ZEMS404012-3R3M | 3.30 | 67.00 | 80.00 | 4.70 | 4.20 | 5.70 | 5.20 |
| ZEMS404012-4R7M | 4.70 | 90.00 | 110.00 | 3.70 | 3.20 | 5.20 | 4.70 |
| ZEMS404012-5R6M | 5.60 | 116.00 | 140.00 | 3.20 | 2.70 | 4.70 | 4.20 |
| ZEMS404012-6R8M | 6.80 | 132.00 | 160.00 | 3.00 | 2.50 | 4.00 | 3.70 |
| ZEMS404012-100M | 10.00 | 200.00 | 235.00 | 2.70 | 2.20 | 3.00 | 2.70 |

Test remarks

Note 1.: All test data is referenced to 25 ℃ ambient.

Note 2.: Test Condition:1MHz, 1.0Vrms.

Note 3.: Irms:DC current (A) that will cause an approximate △T of 40 ℃.

Note 4.: Isat:DC current (A) that will cause L0 to drop approximately 30%.

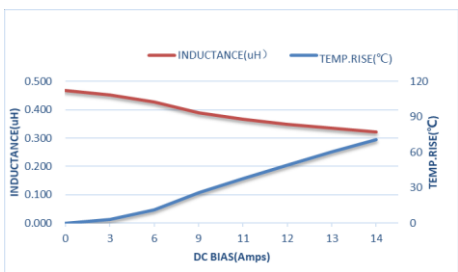
Note 5.: Operating Temperature Range -55℃ to + 125℃.

Note 6.: The part temperature (ambient + temp rise) should not exceed 125 under ℃ the worst case operating conditions.
Circuit design, component placement, PCB trace size and thickness, airflow and other cooling provision all affect the part temperature. Part temperature should be verified in the end application.

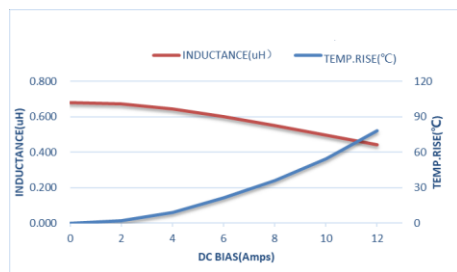
Note 7.: The rated current as listed is either the saturation current or the heating current depending on which value is lowe.

# Characteristic curve 特性曲线

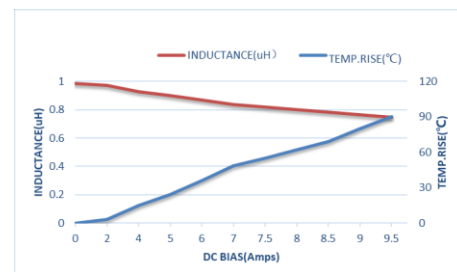
ZEMS404012-R47M



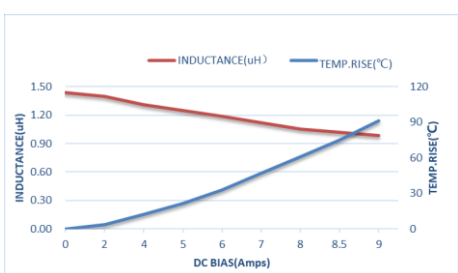

ZEMS404012-R68M



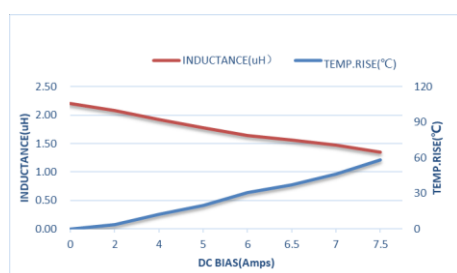

ZEMS404012-1R0M



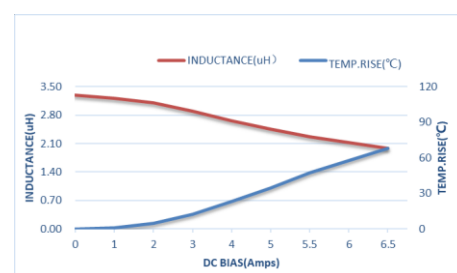

ZEMS404012-1R5M



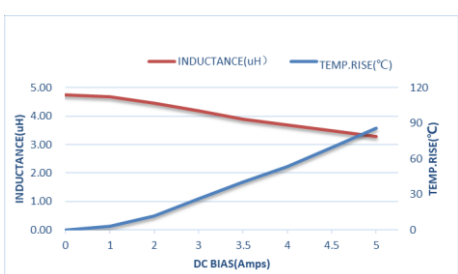

ZEMS404012-2R2M



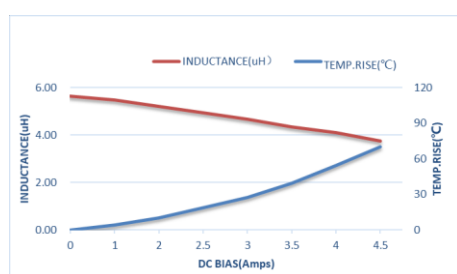

ZEMS404012-3R3M



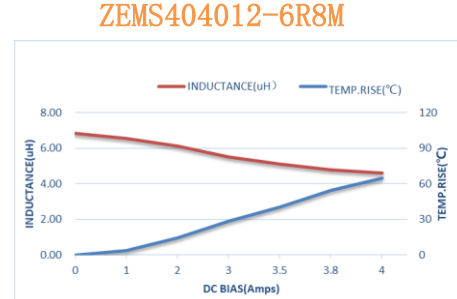

ZEMS404012-4R7M



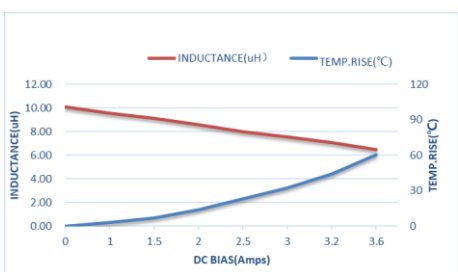

ZEMS404012-5R6M



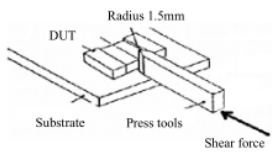
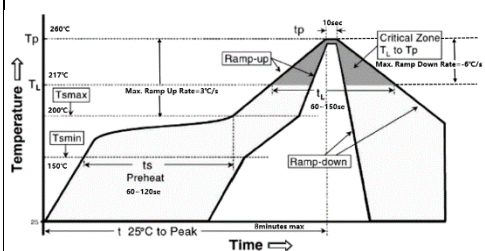
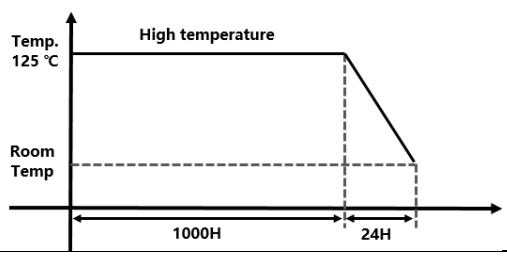
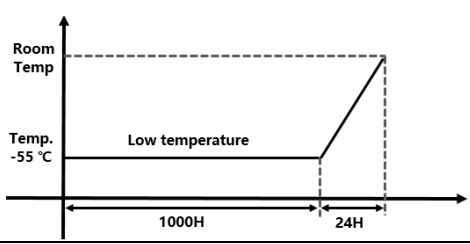

ZEMS404012-6R8M



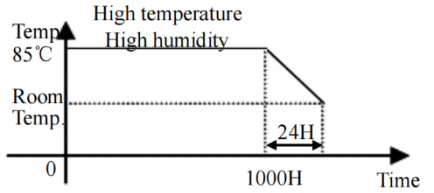
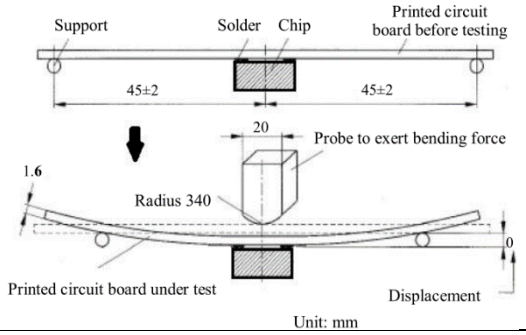

ZEMS404012-100M



## ◆ 可靠性测试

| No. | Item | Requirements | Test Methods and Remarks | Reference | Sample Size |
|---|---|---|---|---|---|
| 1 | Solderability | (1) No case deformation or change in appearance.<br>(2) Terminal area must have 95% min. Solder coverage. | ①Temperature:245± 5℃.<br>②Solder Composition: Sn/Ag3.0/Cu0.5(Pb-Free).<br>③Sample immersion tin furnace 5 ±0.5s. | AEC-Q200 (J-STD 002) | 32 |
| 2 | Adhesion of teral electrode | (1)Strong bond between the pad and the core, without come off PCB. | ①Preconditioning：245℃Reflow 3 times<br>②Inductors shall be subjected to (260+0/-5℃.)℃ for (10±5)s Soldering in the base whit 0.3mm solder.<br>③Aplombelectrode way plus tax 12 N for (10±1) seconds.<br>  | AEC-Q200 (AEC-Q200-006) | 32 |
| 3 | Reflow test | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ① The peak temperature: 260+0/-5℃.<br>② Reflow:3times.<br>③ Temperature curve is as below<br>  | AEC-Q200 (MIL-STD-202 Method 210) | 32 |
| 4 | High temperature | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ① Preconditioning: Bake at 125+5℃ for 24±0.5H，245℃Reflow 3 times<br>②Temperature: 125±2℃.<br>③ Time : 1000 hours.<br>④Measurement at 24±4 hours after test conclusion<br>  | AEC-Q200 (MIL-STD -202 Method 108) | 77 |
| 5 | Low temperature | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ①Preconditioning: Bake at 125+5℃ for 24±0.5H，245℃Reflow 3 times<br>②Temperature: -55±2℃.<br>③Time : 1000 hours.<br>④ Measurement at 24±4 hours after test conclusion<br>  | JESD22-A119A | 77 |
| 6 | Thermal shock | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ①Preconditioning: Bake at 125+5℃ for 24±0.5H，245℃Reflow 3 times<br>②Repeat 500 cycle as follow :<br>(-55±2 ℃ ,30±3minutes) 、(Room temperature, 5 minutes)、(+125±2 ℃ ,30±3minutes)、(Room temperature, 5 minutes)<br>③Measurement at 24±4 hours after test conclusion | MIL-STD -202 Method 107 | 77 |

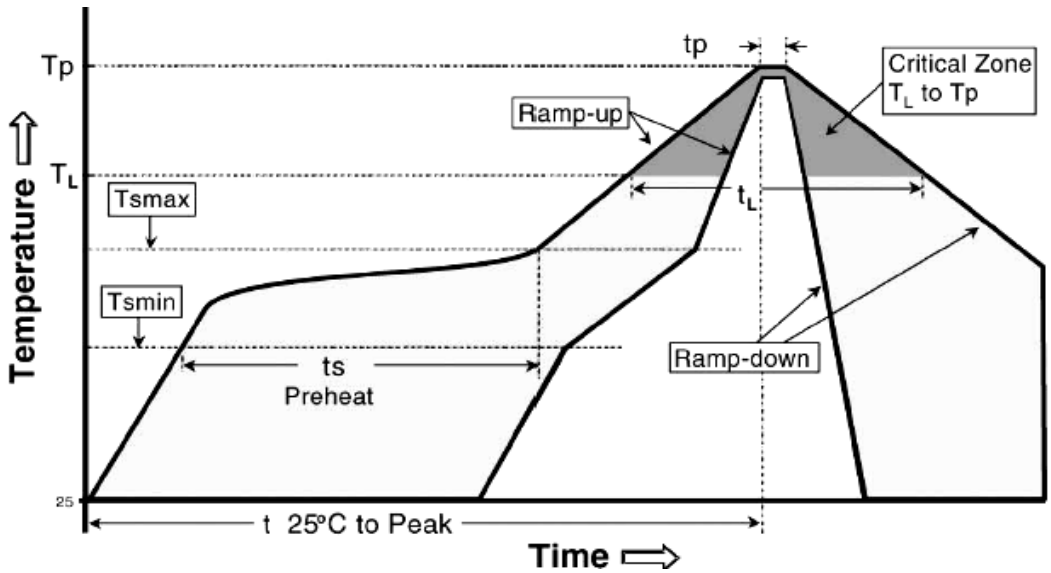
## ◆ 可靠性测试

| No. | Item | Requirements | Test Methods and Remarks | Reference | Sample Size |
|---|---|---|---|---|---|
| 7 | Resistance to Soldering Heat | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ①Solder Composition: Sn/Ag3.0/Cu0.5(Pb-Free).<br>②Solder Temperature: 260±5℃.<br>③Immersion Time: 10±1sec. | AEC-Q200（MIL-STD-202 Method 210） | 32 |
| 8 | Static Humidity | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ①Preconditioning: Bake at 125+5℃ for 24±0.5H，245℃Reflow 3 times<br>②1000 hours, 85°C/85%RH.<br>③ Unpowered.<br>④Measurement at 24±4 hours after test conclusion<br>  | AEC-Q200 (MIL-STD-202 Method 103) | 77 |
| 9 | Board Flex | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ①Preconditioning：245℃Reflow 3 times<br>②Part mounted on a 100mm*40mm FR4 PCB board, which is 1.6±0.2 mm thick and as a Layer-thickness 35 μm ± 10 μm.<br>③ Bending speed is 1mm/s.<br>④ Keeping the P.C Board 2 mm minimum for 60 seconds.<br>  | AEC-Q200 (AEC-Q200-005) | 30 |
| 10 | Vibration | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ①Preconditioning：245℃Reflow 3 times<br>②Frequency range : 10~2000Hz.<br>③Amplitude: 1.5mm or 20g.<br>④ Sweep time and duration: 10~2000~10Hz for 20 minutes.<br>⑤ Each four hours in X,Y,Z direction, 12hours in total. | AEC-Q200 (MIL-STD-202 Method 204) | 32 |
| 11 | Mechanical Shock | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ① Preconditioning：245℃Reflow 3 times<br>②Peak acceleration:100G/S<br>③Duration of pulse:6ms<br>④3times in each of 6(±X, ±Y, ±Z) axes. | AEC-Q200 (MIL-STD-202 Method 213) | 32 |
| 12 | Loading at High Temperature | (1) No physical damage.<br>(2) \| ΔL0/L0 \| ≤10% | ①Preconditioning: Bake at 125+5℃ for 24±0.5H，245℃Reflow 3 times<br>②Temperature: 85±2°C.<br>③ Time : 1000 hours.<br>④ Applied Current : Rated current.<br>⑤Measurement at 24±4 hours after test conclusion | AEC-Q200 (MIL-STD-202 Method 108) | 77 |

# Soldering Condition

**(This is for recommendation, please customer perform adjustment according to actual application)**

Recommend Reflow Soldering Profile：(solder : Sn96.5 / Ag3 / Cu0.5)




| Profile Feature | Lead (Pb)-Free solder |
|---|---|
| Preheat：<br>Temperature Min ($Ts_{min}$)<br>Temperature Max ($Ts_{max}$)<br>Time ($Ts_{min}$ to $Ts_{max}$ ) (ts) | <br>150℃<br>200℃<br>60 -120 seconds |
| Average ramp-up rate：<br>(Ts max to Tp) | <br>3℃ / second max. |
| Time maintained above :<br>Temperature ($T_L$)<br>Time ($t_L$) | <br>217℃<br>60-150 seconds |
| Peak Temperature (Tp) | 260℃ |
| Time within $^{+0}_{-5}$℃ of actual peak Temperature (tp)[2] | 10 seconds |
| Ramp-down Rate | 6℃/second max. |
| Time 25℃ to Peak Temperature | 8minutes max. |

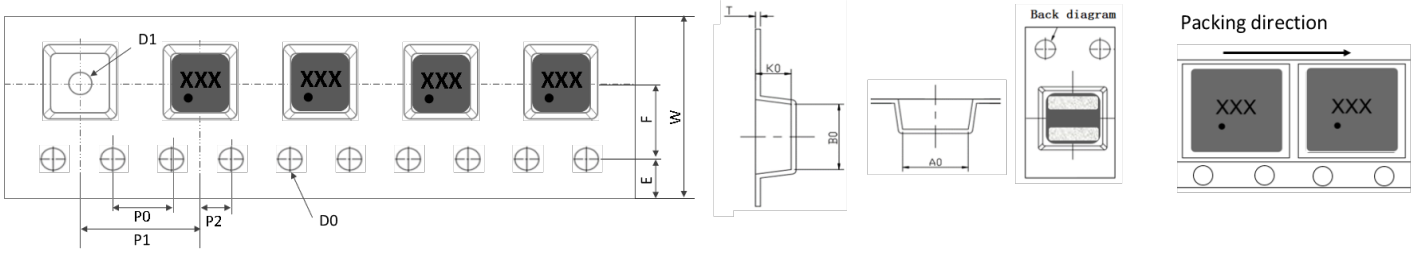
Allowed Re-flow times : 2 times

Remark : To avoid discoloration phenomena of chip on terminal electrodes, please use $N_2$ Re-flow furnace .

# Packing

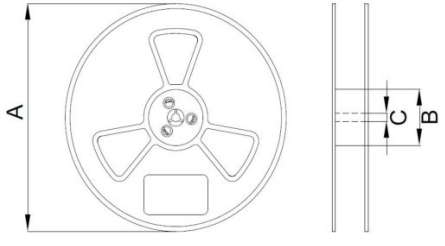
1 Dimension of plastic taping: (Unit: mm)

The following dimensions are related to the actual fit of the machine， for reference only.




| Series | W | A0 | B0 | D0 | D1 | E |
|---|---|---|---|---|---|---|
| Tolerance | ±0.30 | +0.10 | +0.10 | +0.1 | ±0.20 | ±0.10 |
| 404012 | 12.0 | 4.40 | 4.40 | 1.5 | 1.5 | 1.75 |

| Series | F | K0 | P0 | P2 | P1 | T | 包装 |
|---|---|---|---|---|---|---|---|
| Tolerance | ±0.10 | ±0.10 | ±0.10 | ±0.10 | ±0.10 | ±0.05 | 数量 |
| 404012 | 5.5 | 1.30 | 4.0 | 2.0 | 8.0 | 0.30 | 3K |

2 Dimension of Reel：(Unit: mm)

| Type | A ±2.0 | B ±2.0 | C ±2.0 |
|---|---|---|---|
| All | 330 | 100 | 13.0 |