

DATA SHEET

Product Name Anti-Sulfurized Thick Film Chip Resistors (Automotive Grade)

Part Name NS01~NS12 Series

Uniroyal Electronics Global Co., Ltd.

88 Longteng Road, Economic & Technical Development Zone, Kunshan, Jiangsu, China

Tel +86 512 5763 1411 / 22 /33

Email marketing@uni-royal.cn

Manufacture Plant Uniroyal Electronics Industry Co., Ltd.
KunShan Funtex Electronics Technology Co., Ltd.
Ticrom Technology (ShenZhen) Co., Ltd.
Aeon Technology Corporation

Brands *RoyalOhm* *UniOhm*



1. Scope

- 1.1 This specification for approve relates to Anti-Sulfurized Thick Film Chip Resistors manufactured by UNI-ROYAL.
- 1.2 Superior Anti-Sulfurized
- 1.3 Superior Anti-Surge Voltage performance
- 1.4 Suitable for reflow & wave soldering
- 1.5 Application automobile industry, comply with the relevant provisions of AEC-Q200, NS01:36% power rating under +125℃ ; NS02~NS12 100% power rating under +125℃

2. Part No. System

Part No. includes 14 codes shown as below:

2.1 1st~4th codes: Part name. E.g.: NS01, NS02, NS03, NS05, NS06, NS07, NS10, NS12

2.2 5th~6th codes: Power rating.

E.g.: W=Normal Size		“1~G” = “1~16”								
Wattage	1/32	3/4	1/2	1/3	1/4	1/8	1/10	1/16	1/20	1
Normal Size	WH	07	W2	W3	W4	W8	WA	WG	WM	1W

If power rating is lower or equal than 1 watt, 5th code would be “W” and 6th code would be a number or letter.

E.g.: WA=1/10W

W4=1/4W

2.3 7th code: Tolerance. E.g.: D=±0.5% F=±1% G=±2% J=±5% K= ±10%

2.4 8th~11th codes: Resistance Value.

2.4.1 If value belongs to standard value of ≥5% series, 8th code would be zero, 9th~10th codes are significant figures of the resistance and 11th code is the power of ten.

2.4.2 If value belongs to standard value of ≤2% series, 8th~10th codes are significant figures of the resistance, and 11th code is the power of ten.

2.4.3 11th codes listed as following:

0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵ 6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴

2.5 12th~14th codes.

2.5.1 12th code: Packaging Type. E.g.: C=Bulk

T=Tape/Reel

2.5.2 13th code: Standard Packing Quantity.

4=4000pcs

5=5000pcs

C=10000pcs

D=20000pcs

E=15000pcs

Chip Product: BD=B/B-20000pcs

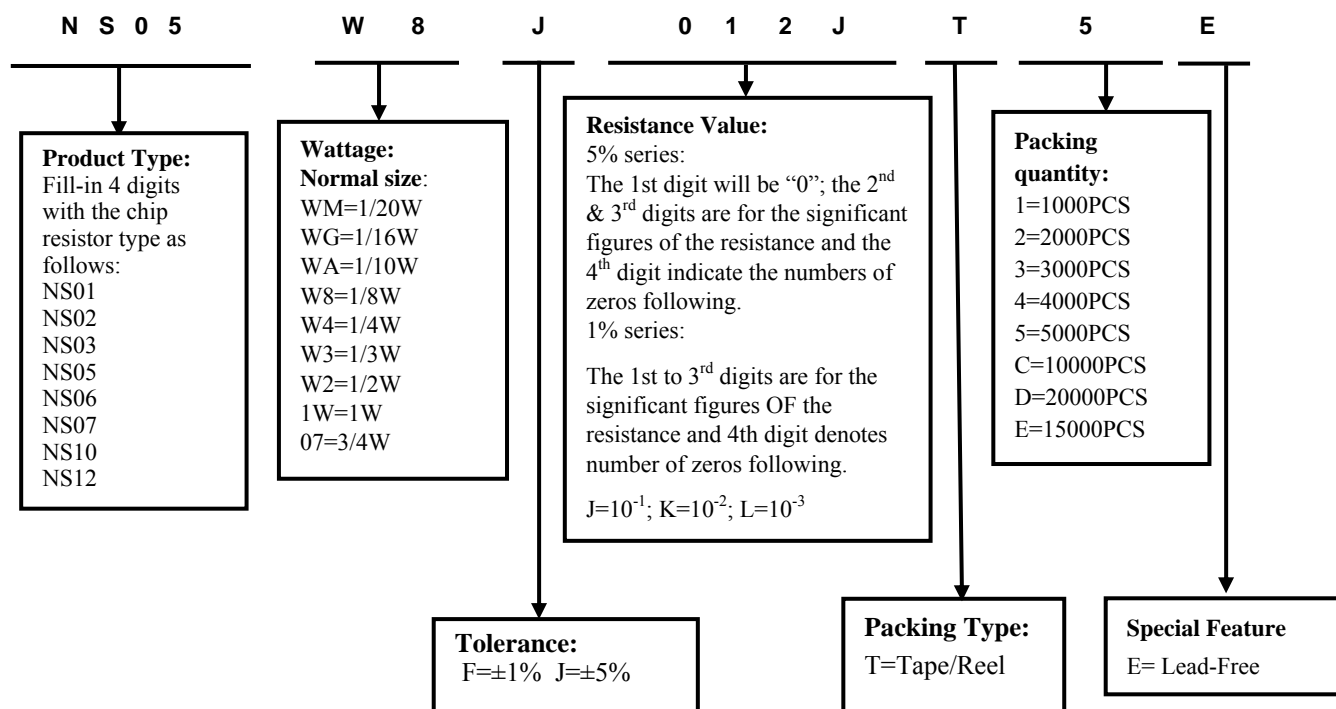
TC=T/R-10000pcs

2.5.3 14th code: Special features.

E = Environmental Protection, Lead Free, or Standard type.

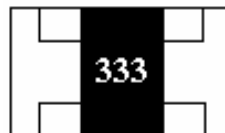
3. Ordering Procedure

(Example: NS05 1/8W ±5% 1.2Ω T/R-5000)



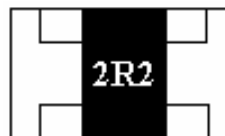
4. Marking:

(1) $\pm 5\%$ Tolerance: The first two digits are significant figures of resistance and the third denotes number of zeros following



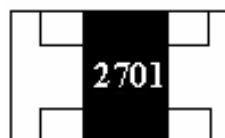
333 \rightarrow 33K Ω

(2) $\pm 5\%$ Tolerance: Below 10 Ω show as following, read alphabet "R" as decimal point.



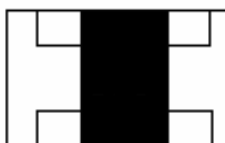
2R2 \rightarrow 2.2 Ω

(3) $\pm 1\%$ Tolerance: 4 digits, first three digits are significant; forth digit is number of zeros. Letter "R" is decimal point.



2701 \rightarrow 2.7K Ω

(4) Normally, the making of NS01, NS02 resistors as following

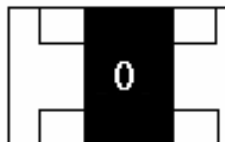


(5) 0 Ω Marking:

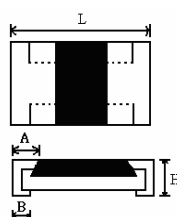
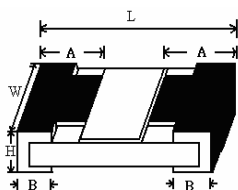
Normally, the making of 0 Ω NS03, 0 Ω NS05, 0 Ω

NS06, 0 Ω NS07, 0 Ω NS10, 0 Ω NS12 resistors

as following



0 \rightarrow 0 Ω

5. Dimension

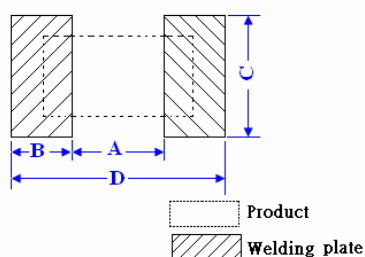
Type	Dimension(mm)				
	L	W	H	A	B
NS01(0201)	0.60 \pm 0.03	0.30 \pm 0.03	0.23 \pm 0.03	0.12 \pm 0.05	0.15 \pm 0.05
NS02(0402)	1.00 \pm 0.10	0.50 \pm 0.05	0.35 \pm 0.05	0.20 \pm 0.10	0.25 \pm 0.10
NS03(0603)	1.60 \pm 0.10	0.80 \pm 0.10	0.45 \pm 0.10	0.30 \pm 0.20	0.30 \pm 0.20
NS05(0805)	2.00 \pm 0.15	1.25 \pm 0.15/-0.10	0.55 \pm 0.10	0.40 \pm 0.20	0.40 \pm 0.20
NS06(1206)	3.10 \pm 0.15	1.55 \pm 0.15/-0.10	0.55 \pm 0.10	0.45 \pm 0.20	0.45 \pm 0.20
NS07(1210)	3.10 \pm 0.10	2.60 \pm 0.20	0.55 \pm 0.10	0.50 \pm 0.25	0.50 \pm 0.20
NS10(2010)	5.00 \pm 0.10	2.50 \pm 0.20	0.55 \pm 0.10	0.60 \pm 0.25	0.50 \pm 0.20
NS12(2512)	6.35 \pm 0.10	3.20 \pm 0.20	0.55 \pm 0.10	0.60 \pm 0.25	0.50 \pm 0.20

6. Resistance Range

Type	Power Rating at 70 $^{\circ}$ C	Resistance Range	
		1.0%	5.0%
NS01	1/20W	1 Ω -10M Ω	1 Ω -10M Ω
NS02	1/16W	1 Ω -10M Ω	1 Ω -10M Ω
NS03	1/10W	1 Ω -10M Ω	1 Ω -10M Ω
NS05	1/8W	1 Ω -10M Ω	1 Ω -10M Ω
NS06	1/4W	1 Ω -10M Ω	1 Ω -10M Ω
NS07	1/3W	1 Ω -10M Ω	1 Ω -10M Ω
NS10	3/4W	1 Ω -10M Ω	1 Ω -10M Ω
NS12	1W	1 Ω -10M Ω	1 Ω -10M Ω

7. Ratings

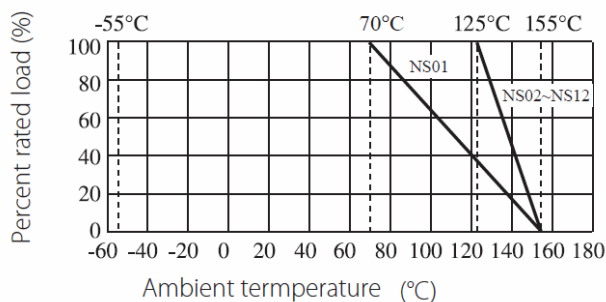
Type	Max. Working Voltage	Max. Overload Voltage	Dielectric withstanding Voltage	Resistance Value of Jumper	Rated Current of Jumper	Max. Overload Current of Jumper	Operating Temperature
NS01	25V	50V	/	<50mΩ	0.5A	1A	-55℃~155℃
NS02	50V	100V	100V	<50mΩ	1A	2A	-55℃~155℃
NS03	75V	150V	300V	<50mΩ	1A	2A	-55℃~155℃
NS05	150V	300V	500V	<50mΩ	2A	5A	-55℃~155℃
NS06	200V	400V	500V	<50mΩ	2A	10A	-55℃~155℃
NS07	200V	500V	500V	<50mΩ	2A	10A	-55℃~155℃
NS10	200V	500V	500V	<50mΩ	2A	10A	-55℃~155℃
NS12	200V	500V	500V	<50mΩ	2A	10A	-55℃~155℃

8. Recommend the size of welding plate

Type	Dimension(mm)			
	A	B	C	D
NS01	0.3±0.05	0.35±0.05	0.4±0.05	1.0±0.05
NS02	0.5±0.05	0.5±0.05	0.6±0.05	1.5±0.05
NS03	0.8±0.05	0.8±0.05	0.9±0.05	2.4±0.05
NS05	1.0±0.1	1±0.1	1.4±0.1	3±0.1
NS06	2.0±0.1	1.1±0.1	1.8±0.1	4.2±0.1
NS07	2.0±0.1	1.1±0.1	2.9±0.1	4.2±0.1
NS10	3.6±0.1	1.4±0.1	3±0.1	6.4±0.1
NS12	4.9±0.1	1.35±0.1	3.7±0.1	7.6±0.1

9. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 125℃ (NS01 is from -55℃ to 70℃). For temperature is in excess of 125℃ (NS01 temperature is in excess of 70℃), the load shall be derate as shown in figure :



Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working

Voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P \times R}$$

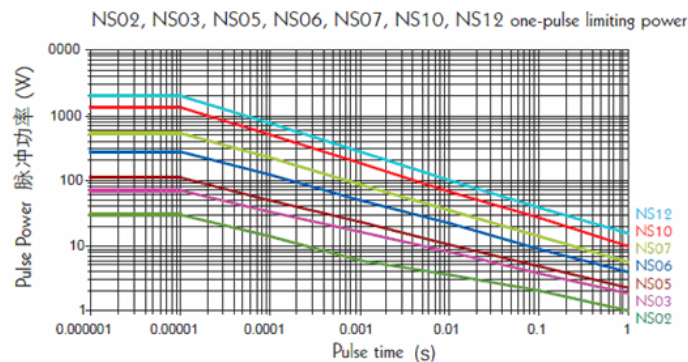
Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.)

R = nominal resistance (OHM)

In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less

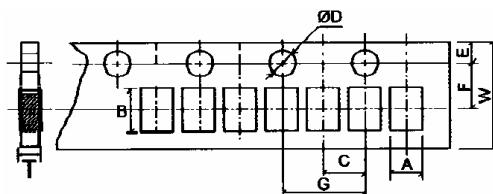
10. Structure**11. One-pulse Limiting Electric Power****12. Performance Specification**

Characteristic	Limits	Ref. Standards	Test Method
Operational life	$\pm 5\%: \pm(3\%+0.1\Omega)\text{Max.}$ $\pm 1\%: \pm(1\%+0.1\Omega)\text{Max.}$	MIL-STD-202	NS01: 125°C, 36% power ; NS02~NS12: 125°C, 100% power, at RCWV or Max. Working Voltage whichever less, 1000h (1.5 hours "ON", 0.5 hour "OFF"). Measurement at 24 ± 4 hours after test conclusion.
	$<100\text{m}\Omega$		Apply to rate current for 0 Ω
Electrical Characterization	$1\Omega \leq R \leq 10\Omega: \pm 400 \text{ ppm}/^\circ\text{C}$ $10\Omega < R \leq 100\Omega: \pm 200 \text{ ppm}/^\circ\text{C}$ $100\Omega < R \leq 10\text{M}\Omega: \pm 100 \text{ ppm}/^\circ\text{C}$ NS01: $10\Omega < R \leq 10\text{M}\Omega: \pm 200 \text{ ppm}/^\circ\text{C}$	User Spec	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Short-time overload	$\pm 1\%: \pm(1\%+0.1\Omega)\text{Max.}$ $\pm 5\%: \pm(2\%+0.1\Omega)\text{Max.}$	JIS-C-5201	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds..
	$<50\text{m}\Omega$		Apply max Overload current for 0 Ω
External Visual	No Mechanical Damage	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship
Physical Dimension	Reference 5. Dimension Standards	JESD22 MH Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.
Resistance to Solvent	Marking Unsmearred	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	Not broken	JIS-C-6429	Force of 1.8kg for 60 seconds.
High Temperature Exposure (Storage)	$\pm(1\%+0.1\Omega)\text{Max.}$	MIL-STD-202 Method 108	1000hrs. @ $T=155^\circ\text{C}$. Unpowered. Measurement at 24 ± 2 hours after test conclusion.
	$<50\text{m}\Omega$		Apply to rate current for 0 Ω
Temperature Cycling	$\pm(1\%+0.1\Omega)\text{Max.}$	JESD22 Method JA-104	1000 Cycles (-55°C to $+155^\circ\text{C}$). Measurement at 24 ± 2 hours after test conclusion.
	$<50\text{m}\Omega$		Apply to rate current for 0 Ω

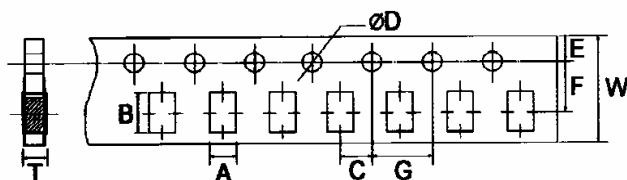
Biased Humidity	$\pm 5\%: \pm(3\%+0.1\Omega)\text{Max.}$ $\pm 1\%: \pm(1\%+0.1\Omega)\text{max.}$	MIL-STD-202 Method 103	1000 hours 85°C, 85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±2 hours after test conclusion.
	<100mΩ		Apply to rate current for 0 Ω
Mechanical Shock	$\pm(1\%+0.1\Omega)\text{Max.}$	MIL-STD-202 Method 213	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6ms, velocity 12.3ft/s 100Hz.
Vibration	$\pm(1\%+0.1\Omega)\text{Max.}$	MIL-STD-202 Method 204	5g's for 20 min., 12cycle each of 3 orientations. Note: Use 8"×5"PCB, 0.031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2' from any secure point. Test from 10-2000Hz.
ESD	$\pm(1\%+0.1\Omega)\text{Max.}$	AEC-Q200-002	With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of ±500V, ±1KV, ±2KV, ±4KV, ±8KV, The electrometer reading shall be within ±10% for voltages from 500V to ≤800V.
Solderability	95% coverage Min.	J-STD-002	For both leaded & SMD. Electrical test not required. Magnification 50X. Conditions: a) Method B 4hrs at 155°C dry heat, the dip in bath with 245°C, 5s. b) Method D: at 260°C, 60s.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	UL-94	V-0 or V-1 are acceptable. Electrical test not required.
Board Flex	$\pm(1\%+0.05\Omega)\text{Max.}$	JIS-C-6429	3mm (Min.), 60s
	<50mΩ		Apply to rate current for 0 Ω
Flame Retardance	No flame	AEC-Q200-001	Temperature sensing at 500°C, Voltage power subjected to 32VDC current clamped up to 500VDC and decreased in 1.0VDC/hour.
Resistance to Soldering Heat	$\pm(1\%+0.05\Omega)\text{Max.}$	MIL-STD-202 Method 210	Condition B No per-heat of samples. Note: Single Wave Solder-Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body.
	<50mΩ		Apply to rate current for 0 Ω
Sulfuration test	$\Delta R \leq \pm(5\%+0.1\Omega)$	/	Soaked in industrial oil with sulfur substance 3.5% contained 105°C ±3°C 500H

13. Packing of Surface Mount Resistors

13.1 Dimension of Paper Taping : (Unit: mm)

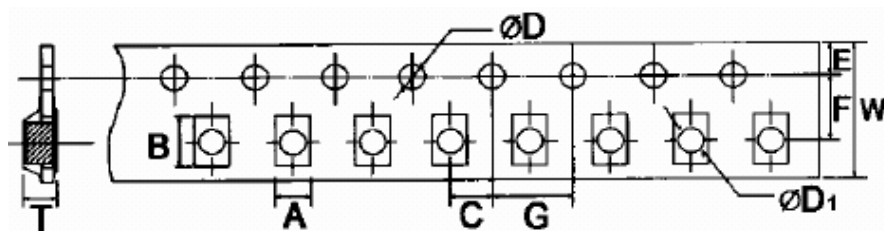


Type	A	B	C ±0.05	+0.1 ΦD -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T
NS01	0.40±0.05	0.70±0.05	2.0	1.5	1.75	3.50	4.0	8.0	0.42±0.1
NS02	0.65 ±0.1	1.2±0.1	2.0	1.5	1.75	3.5	4.0	8.0	0.42±0.05



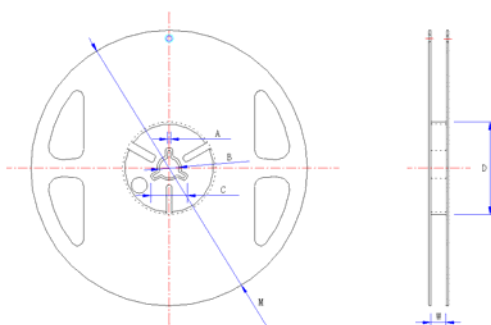
Type	A ±0.2	B ±0.2	C ±0.05	+0.1 ØD -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T ±0.1
NS03	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
NS05	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
NS06	2.00	3.60	2.0	1.5	1.75	3.5	4.0	8.0	0.81
NS07	2.80	3.50	2.0	1.5	1.75	3.5	4.0	8.0	0.75

13.2 Dimension of Embossed Taping: (Unit: mm)



Type	A ±0.2	B ±0.2	C ±0.05	+ 0.1 ØD - 0	+0.25 ØD1 -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T ±0.1
NS10	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
NS12	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00

13.3 Dimension of Reel : (Unit: mm)



Type	Taping	Qty/Reel	A ±0.5	B ±0.5	C ±0.5	D ±1	M ±2	W ±1
NS01	Paper	15,000pcs	2.0	13.0	21.0	60.0	178	10
NS02	Paper	10,000pcs	2.0	13.0	21.0	60.0	178	10
NS03	Paper	5,000pcs	2.0	13.0	21.0	60.0	178	10
NS05	Paper	5,000pcs	2.0	13.0	21.0	60.0	178	10
NS06	Paper	5,000pcs	2.0	13.0	21.0	60.0	178	10
NS07	Paper	5,000pcs	2.0	13.0	21.0	60.0	178	10
NS10	Embossed	4,000pcs	2.0	13.0	21.0	60.0	178	13.8
NS12	Embossed	4,000pcs	2.0	13.0	21.0	60.0	178	13.8



14. Note

14.1 UNI-ROYAL recommend the storage condition temperature: 15°C~35°C, humidity :25%~75%.

(Put condition for individual product).

Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old. (Put condition for each product) may be degraded.

14.2 Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.

Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

14.3 Product performance and soldered connections may deteriorate if the products are stored in the following places:

- a. Storage in high Electrostatic.
- b. Storage in direct sunshine、rain and snow or condensation.

15. Record

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~8	Mar.20, 2018	Chen Haiyan	Chen Nana
2	Modify NS01 packing quantity	8	Jun.06, 2018	Chen Haiyan	Chen Nana

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