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Data Sheet

Customer: _____

Product : Automotive Multilayer Chip Inductors

Size: 1608 、 201209 、 201212

Issued Date: _____

Edition : _____

Record of change

Date	Ver.	Description	Page

VENDOR :

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1. SCOPE

- ◆ HALVS series multilayer chip inductor for automotive application. Size 1608,202009,201212
- ◆ AEC-Q200 certified.

2. STANDARD ATMOSPHERIC CONDITIONS

Unless otherwise specified the standard range of atmospheric conditions for making measurements and tests is as follows:

- Ambient temperature : $20 \pm 15^{\circ}\text{C}$
- Relative humidity : 30~70%

If there may be any doubt on the results, measurements shall be made within the following limits :

- Ambient temperature : $25 \pm 5^{\circ}\text{C}$
- Relative humidity : 30~70%

3. RATINGS

SIZE 201212

TYPE : HALVS

PART NO.	Q MIN	Inductance Tolerance	Test Frequency (MHz)	SRF min(MHz)	DCR (Ω) Max	Rated Current ※(mA)max
HALVS2012-2R7K,M	45	$2.7\mu\text{H} \pm 10\%, \pm 20\%$	10	45	0.75	30
HALVS2012-3R3K,M	45	$3.3\mu\text{H} \pm 10\%, \pm 20\%$	10	41	0.80	30
HALVS2012-3R9K,M	45	$3.9\mu\text{H} \pm 10\%, \pm 20\%$	10	38	0.90	30
HALVS2012-4R7K,M	45	$4.7\mu\text{H} \pm 10\%, \pm 20\%$	10	35	1.00	30
HALVS2012-5R6K,M	50	$5.6\mu\text{H} \pm 10\%, \pm 20\%$	4	32	0.90	15
HALVS2012-6R8K,M	50	$6.8\mu\text{H} \pm 10\%, \pm 20\%$	4	29	1.00	15
HALVS2012-8R2K,M	50	$8.2\mu\text{H} \pm 10\%, \pm 20\%$	4	26	1.10	15
HALVS2012-100K,M	50	$10\mu\text{H} \pm 10\%, \pm 20\%$	2	24	1.15	15
HALVS2012-120K,M	50	$12\mu\text{H} \pm 10\%, \pm 20\%$	2	22	1.25	15
HALVS2012-150K,M	30	$15\mu\text{H} \pm 10\%, \pm 20\%$	1	19	0.80	5
HALVS2012-180K,M	30	$18\mu\text{H} \pm 10\%, \pm 20\%$	1	18	0.90	5
HALVS2012-220K,M	30	$22\mu\text{H} \pm 10\%, \pm 20\%$	1	16	1.10	5
HALVS2012-270K,M	30	$27\mu\text{H} \pm 10\%, \pm 20\%$	1	14	1.15	5
HALVS2012-330K,M	30	$33\mu\text{H} \pm 10\%, \pm 20\%$	1	13	1.25	5

※ The maximum rated current : the DC current value having temperature increased 40°C after thru DC current 2 hours at ambient temperature.

PART NO.	Q MIN	Inductance Tolerance	Test Frequency (MHz)	SRF min(MHz)	DCR (Ω) Max	Rated Current ※(mA)max
HALVS2012-47NM	15	0.047μH ±20%	50	320	0.20	300
HALVS2012-68NM	15	0.068μH ±20%	50	280	0.20	300
HALVS2012-82NM	15	0.082μH ±20%	50	255	0.20	300
HALVS2012-R10K,M	20	0.10μH ±10%,±20%	25	235	0.30	250
HALVS2012-R12K,M	20	0.12μH ±10%,±20%	25	220	0.30	250
HALVS2012-R15K,M	20	0.15μH ±10%,±20%	25	200	0.40	250
HALVS2012-R18K,M	20	0.18μH ±10%,±20%	25	185	0.40	250
HALVS2012-R22K,M	20	0.22μH ±10%,±20%	25	170	0.50	250
HALVS2012-R27K,M	20	0.27μH ±10%,±20%	25	150	0.50	250
HALVS2012-R33K,M	20	0.33μH ±10%,±20%	25	145	0.55	250
HALVS2012-R39K,M	25	0.39μH ±10%,±20%	25	135	0.65	200
HALVS2012-R47K,M	25	0.47μH ±10%,±20%	25	125	0.65	200
HALVS2012-R56K,M	25	0.56μH ±10%,±20%	25	115	0.75	150
HALVS2012-R68K,M	25	0.68μH ±10%,±20%	25	105	0.80	150
HALVS2012-R82K,M	25	0.82μH ±10%,±20%	25	100	1.00	150
HALVS2012-1R0K,M	45	1.0μH ±10%,±20%	10	75	0.40	50
HALVS2012-1R2K,M	45	1.2μH ±10%,±20%	10	65	0.50	50
HALVS2012-1R5K,M	45	1.5μH ±10%,±20%	10	60	0.50	50
HALVS2012-1R8K,M	45	1.8μH ±10%,±20%	10	55	0.60	50
HALVS2012-2R2K,M	45	2.2μH ±10%,±20%	10	50	0.65	30

※ The maximum rated current : the DC current value having temperature increased 40 °C after thru DC current 2 hours at ambient temperature.

SIZE 1608

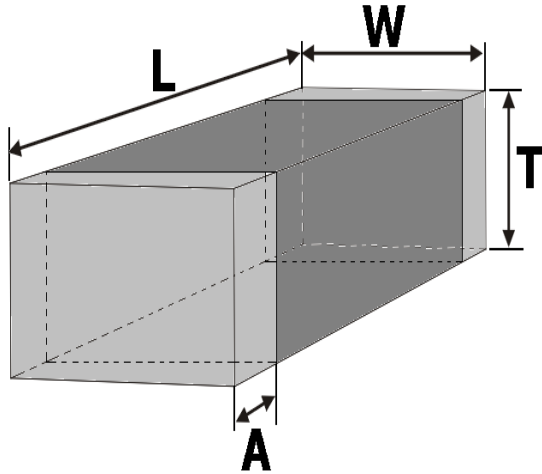
TYPE : HALVS

PART NO.	Q MIN	Inductance Tolerance	Test Frequency (MHz)	SRF min(MHz)	DCR (Ω) Max	Rated Current ※(mA)max
HALVS1608-47NM	10	0.047μH ±20%	50	260	0.30	50
HALVS1608-68NM	10	0.068μH ±20%	50	250	0.30	50
HALVS1608-82NM	10	0.082μH ±20%	50	245	0.30	50
HALVS1608-R10K,M	15	0.10μH ±10%,±20%	25	240	0.50	50
HALVS1608-R12K,M	15	0.12μH ±10%,±20%	25	205	0.50	50
HALVS1608-R15K,M	15	0.15μH ±10%,±20%	25	180	0.60	50
HALVS1608-R18K,M	15	0.18μH ±10%,±20%	25	165	0.60	50
HALVS1608-R22K,M	15	0.22μH ±10%,±20%	25	150	0.80	50
HALVS1608-R27K,M	15	0.27μH ±10%,±20%	25	136	0.80	50
HALVS1608-R33K,M	15	0.33μH ±10%,±20%	25	125	0.85	35
HALVS1608-R39K,M	15	0.39μH ±10%,±20%	25	110	1.00	35
HALVS1608-R47K,M	15	0.47μH ±10%,±20%	25	105	1.35	35
HALVS1608-R56K,M	15	0.56μH ±10%,±20%	25	95	1.55	35
HALVS1608-R68K,M	15	0.68μH ±10%,±20%	25	90	1.70	35
HALVS1608-R82K,M	15	0.82μH ±10%,±20%	25	85	2.10	35
HALVS1608-1R0K,M	35	1.0μH ±10%,±20%	10	75	0.60	25
HALVS1608-1R2K,M	35	1.2μH ±10%,±20%	10	65	0.80	25
HALVS1608-1R5K,M	35	1.5μH ±10%,±20%	10	60	0.80	25
HALVS1608-1R8K,M	35	1.8μH ±10%,±20%	10	55	0.95	25
HALVS1608-2R2K,M	35	2.2μH ±10%,±20%	10	50	1.15	15
HALVS1608-2R7K,M	35	2.7μH ±10%,±20%	10	45	1.35	15
HALVS1608-3R3K,M	35	3.3μH ±10%,±20%	10	40	1.55	15
HALVS1608-3R9K,M	35	3.9μH ±10%,±20%	10	35	1.70	15
HALVS1608-4R7K,M	35	4.7μH ±10%,±20%	10	33	2.10	15
HALVS1608-5R6K,M	35	5.6μH ±10%,±20%	4	22	1.55	5
HALVS1608-6R8K,M	35	6.8μH ±10%,±20%	4	20	1.70	5
HALVS1608-8R2K,M	35	8.2μH ±10%,±20%	4	18	2.10	5
HALVS1608-100K,M	30	10μH ±10%,±20%	2	17	1.85	3
HALVS1608-120K,M	30	12μH ±10%,±20%	2	15	2.10	3
HALVS1608-150K,M	20	15μH ±10%,±20%	1	14	1.70	1
HALVS1608-180K,M	15	18μH ±20%	1	13	2.00	1
HALVS1608-220K,M	15	22μH ±20%	1	11	2.00	1

※ The maximum rated current : the DC current value having temperature increased 40 °C after thru DC current 2 hours at ambient temperature.

3. DIMENSION

TYPE : HALVS



OPERATING TEMP RANGE : $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$

STORAGE TEMP RANGE : $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$

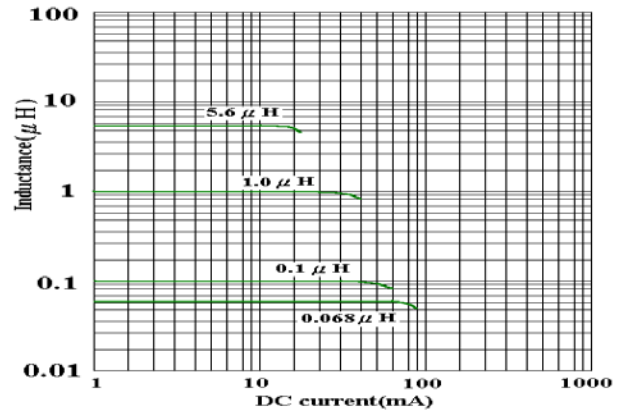
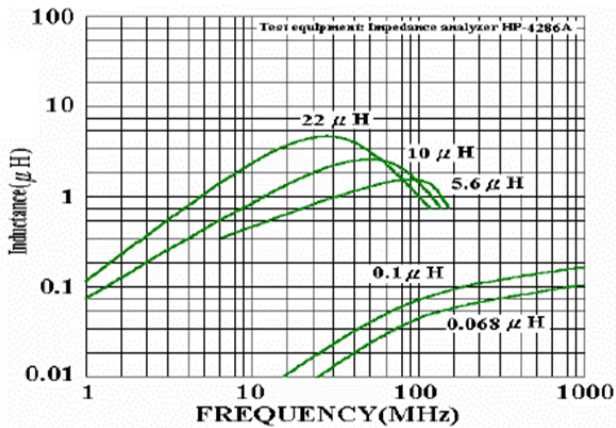
TYPE	L	W	T	A(m/m)
HALVS-1608	1.6 ± 0.15 (.063 \pm .006)	0.8 ± 0.15 (.031 \pm .006)	0.8 ± 0.15 (.031 \pm .006)	0.2~0.6

TYPE	L	W	T	A(m/m)
HALVS-201209	2.0 ± 0.2 (.079 \pm .008)	1.25 ± 0.2 (.049 \pm .008)	0.85 ± 0.2 (.033 \pm .008)	0.2~0.8

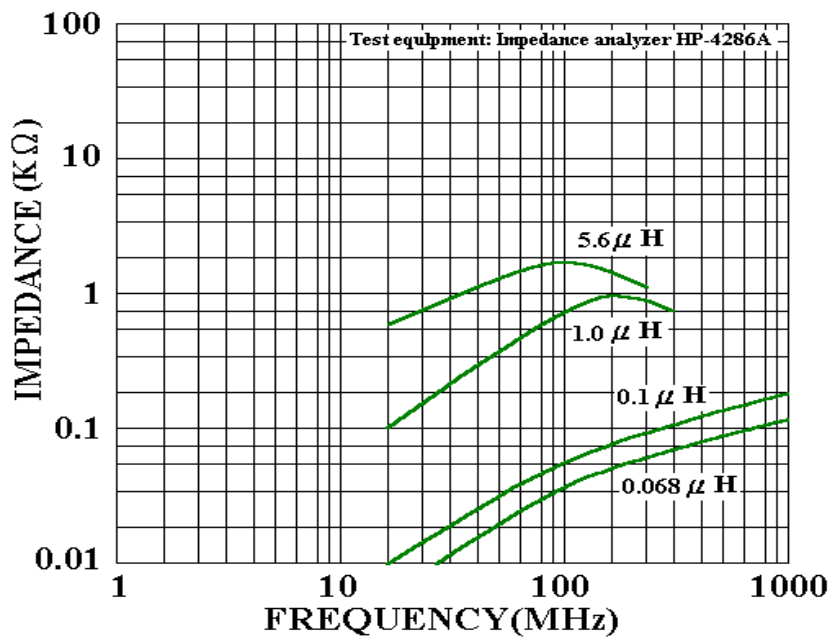
TYPE	L	W	T	A(m/m)
HALVS-201212	2.0 ± 0.2 (.079 \pm .008)	1.25 ± 0.2 (.049 \pm .008)	0.85 ± 0.2 (.033 \pm .008)	0.2~0.8

4. The place of origin : Taiwan

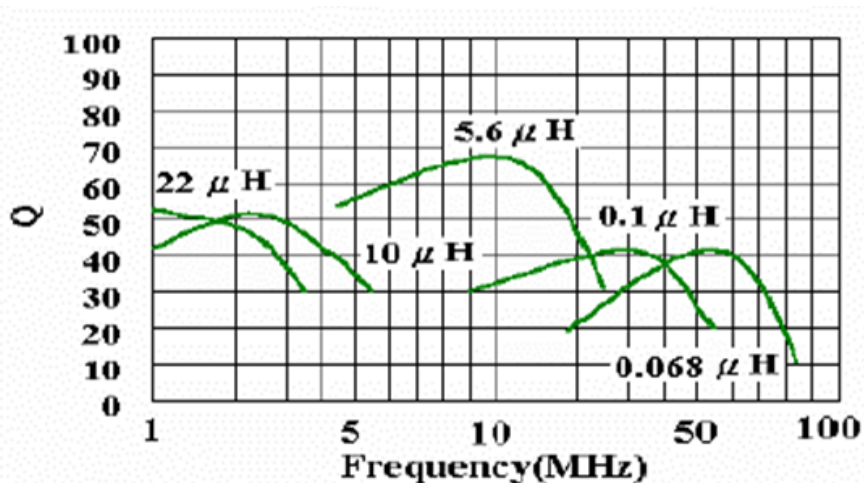
INDUCTANCE VS DC SUPERPOSITION CHARACTERISTICS



IMPEDANCE VS FREQUENCY CHARACTERISTICS



Q VS FREQUENCY CHARACTERISTICS



6. Reflow soldering conditions

TYPE : HALVS

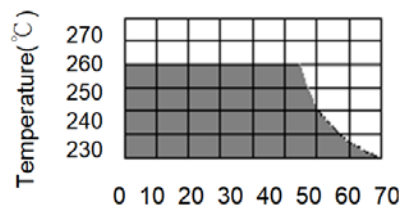
- Pre-heating should be in such a way that the temperature difference between solder and ferrite surface is limited to 150°C max.

Also cooling into solvent after soldering should be in such a way that the temperature difference is limited to 100°C max.

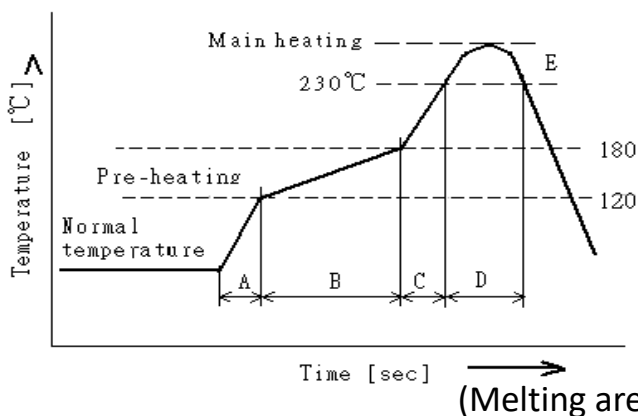
Insufficient pre-heating may cause cracks on the ferrite, resulting in the deterioration of product quality.

- Products should be soldered within the following allowable range indicated by the slanted line.

The excessive soldering conditions may cause the corrosion of the electrode, when soldering is repeated, allowable time is the accumulated time.



◆ Temperature Profile



A	Slope of temp rise	1 to 5	°C/sec
B	Heat time	50 to 150	sec
	Heat temperature	120 to 180	°C
C	Slope of temp rise	1 to 5	°C/sec
D	Time over 230°C	90~120	sec
E	Peak temperature	255~260	°C
	Peak hold time	10 max	sec
No. of mounting		3	times

6-1 Reworking with soldering

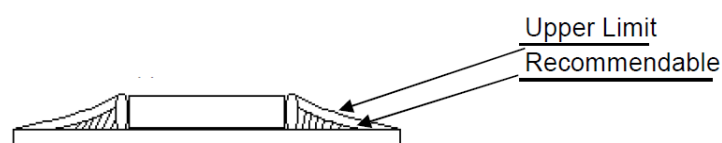
Preheating	150°C, 1 minute
Tip temperature	280°C max.
Soldering time	3 seconds max.
Soldering iron output	30w max.
End of soldering iron	φ 3mm max.

◆ Reworking should be limited to only one time.

Note : Do not directly touch the products with the tip of the soldering iron in order to prevent the crack on the ferrite material due to the thermal shock.

6-2 Solder Volume

Solder shall be used not to be exceed the upper limits as shown below.



Accordingly increasing the solder volume, the mechanical stress to product is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance.

7. Equipment

TYPE : HALVS

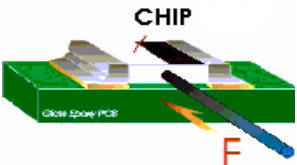
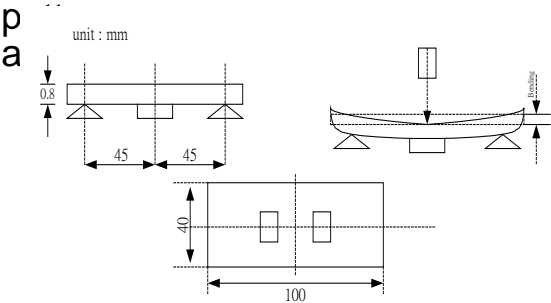
7-1 IMPEDANCE

Impedance shall be measured with HP – 4286A impedance analyzer or equivalent system.

7-2 DC RESISTANCE

DC resistance shall be measured using HP 4338 digital mili – ohm meter with 4 terminal method.

8. Mechanical Characteristics

ITEM	Specification	Test Conditions																											
Terminal Strength	Terminal strength does not distort the case shall meet SPEC DC resistance specifications.	<table border="1"> <thead> <tr> <th>SMD-Size</th> <th>Force g(N)</th> <th>Time Sec.</th> </tr> </thead> <tbody> <tr> <td>1005</td> <td>300g(3N)</td> <td>60+1sec.</td> </tr> <tr> <td>1608</td> <td>500g(5N)</td> <td>60+1sec.</td> </tr> <tr> <td>2012</td> <td>600g(6N)</td> <td>60+1sec.</td> </tr> <tr> <td>3216</td> <td>1000g(10N)</td> <td>60+1sec.</td> </tr> <tr> <td>3225</td> <td>1000g(10N)</td> <td>60+1sec.</td> </tr> <tr> <td>4516</td> <td>1000g(10N)</td> <td>60+1sec.</td> </tr> <tr> <td>4532</td> <td>1500g(15N)</td> <td>60+1sec.</td> </tr> <tr> <td>5650</td> <td>2000g(20N)</td> <td>60+1sec.</td> </tr> </tbody> </table> 	SMD-Size	Force g(N)	Time Sec.	1005	300g(3N)	60+1sec.	1608	500g(5N)	60+1sec.	2012	600g(6N)	60+1sec.	3216	1000g(10N)	60+1sec.	3225	1000g(10N)	60+1sec.	4516	1000g(10N)	60+1sec.	4532	1500g(15N)	60+1sec.	5650	2000g(20N)	60+1sec.
SMD-Size	Force g(N)	Time Sec.																											
1005	300g(3N)	60+1sec.																											
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5650	2000g(20N)	60+1sec.																											
Substrate Bending Test	SPEC substrate bending test DC resistance shall meet specifications $\pm 30\%$.	<p>After soldering a chip to a test substrate, bend the substrate by 2mm hold for 60s and then return. Soldering shall be done in accordance with the recommended PC board</p> 																											
Resistance to Solder Heat	No visible damage Electrical characteristics and mechanical characteristics shall be satisfied. Consult standard MIL-STD-202 METHOD 210	<p>Solder Temp. : $265\pm 3^{\circ}\text{C}$ Immersion time : 6 ± 1 sec Preheating : 100°C to 150°C, 1 minute. Measurement to be made after keeping at room temp for 24 ± 2 hrs. Solder : Sn-3Ag-0.5Cu</p>																											
Solderability	95% min. coverage of all metallized area Consult standard J-STD-002	<p>Solder temp. : $240\pm 5^{\circ}\text{C}$ Immersion time : 3 ± 1 sec</p>																											

9. RELIABILITY AND TEST CONDITIONS

TYPE : HALVS

9-1 HIGH TEMPERATURE RESISTANCE

a. Performance specification

1. Appearance : no mechanical damage
2. Inductance shall be with $\pm 20\%$ of the initial value

b. Test condition

1. Temperature: $125^{\circ}\text{C} \pm 2^{\circ}\text{C}$
2. Testing time : 1000 ± 12 hrs
3. Measurement : After placing at room ambient temperature for 24 hours minimum

9-2 Biased Humidity RESISTANCE

a. Performance specification

1. Appearance : no mechanical damage
2. Inductance shall be with $\pm 20\%$ of the initial value

b. Test condition

1. Humidity: $85 \pm 5\%$ RH
2. Temperature: $85^{\circ}\text{C} \pm 2^{\circ}\text{C}$
3. Testing time: 1000 ± 12 hours
4. Measurement : After placing at room ambient temperature for 24 hours minimum

9-3 TEMPERATURE CYCLE

a. Performance specification

1. Appearance : no mechanical damage
2. Inductance shall be with $\pm 20\%$ of the initial value

b. Test condition

1. Low Temperature: $-55^{\circ}\text{C} \pm 5^{\circ}\text{C}$ kept stabilized for 30 minutes each
2. High Temperature: $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$ kept stabilized for 30 minutes each
3. Cycle : 1000 cycles
4. Measurement : After placing for 24 hours minimum at room ambient temperature
5. step1. -55°C temp $\pm 3^{\circ}\text{C}$ 30 ± 3 minutes
step2. Room temperature 2 to 5 minutes
step3. $+125^{\circ}\text{C}$ temp $\pm 3^{\circ}\text{C}$ 30 ± 3 minutes
step4. room temperature 2 to 5 minutes

9-4 VIBRATION TEST

a. Performance specification

1. Appearance : no mechanical damage
2. Inductance shall be with $\pm 20\%$ of the initial value

b. Test condition

1. Frequency and Amplitude: 10-2000-10 Hz
2. Direction: X, Y, Z.
3. Test duration: 4 hours for each direction, 12 hours in total.

9-5 Mechanical Shock TEST

TYPE : HALVS

a. Performance specification

1. Appearance : no mechanical damage
2. Inductance shall be with $\pm 20\%$ of the initial value

b. Test condition

1. peak acceleration : 100 g's
2. Duration of pulse : 6 ms
3. Waveform : Half-sine
4. Velocity change : 12.3 ft/sec
5. Direction : X , Y , Z (3axes/3 times)

9-6 Operational Life

a. Performance specification

1. Appearance : no mechanical damage
2. Inductance shall be with $\pm 20\%$ of the initial value

b. Test condition

1. Temperature: 125°C $\pm 2^\circ\text{C}$
2. Testing time : 1000 \pm 12hrs
3. Measurement : After placing at room ambient temperature for 24 hours minimum

9-7 Electrostatic discharge test

a. Performance specification

1. Appearance : no mechanical damage
2. Inductance shall be with $\pm 20\%$ of the initial value

b. Test condition

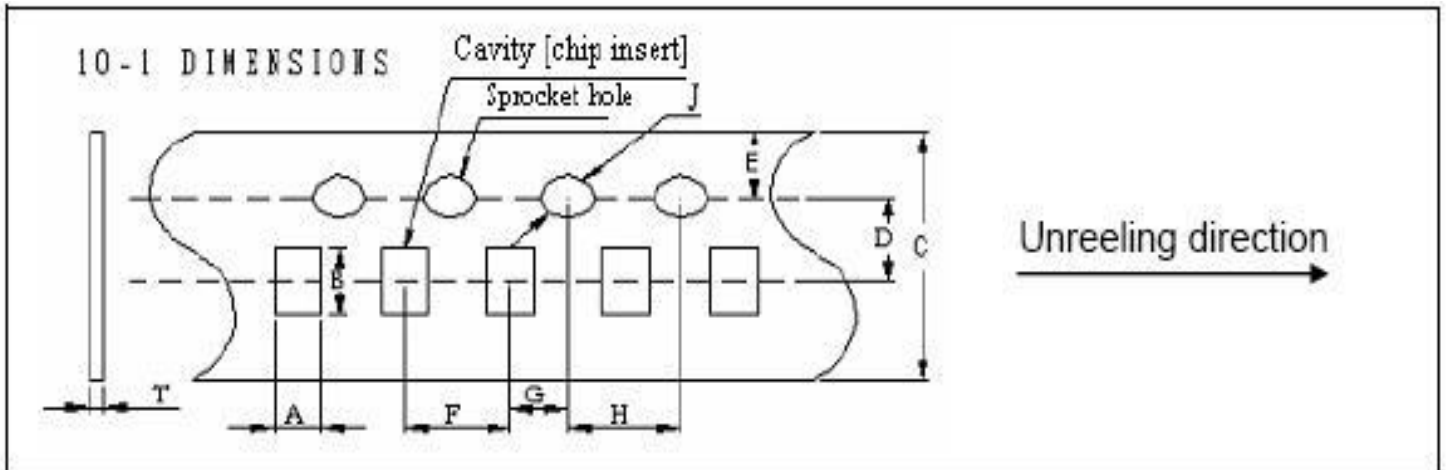
1. ESD voltage: 15k volts
2. Mode 1: 150 pF/330 Ohm
3. Mode 2: 150 pF/2000 Ohm

9.1 REMARK

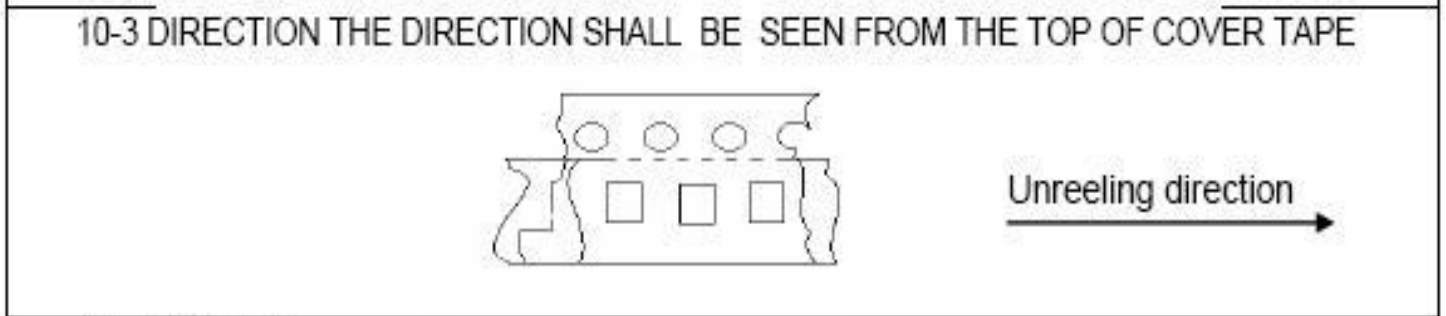
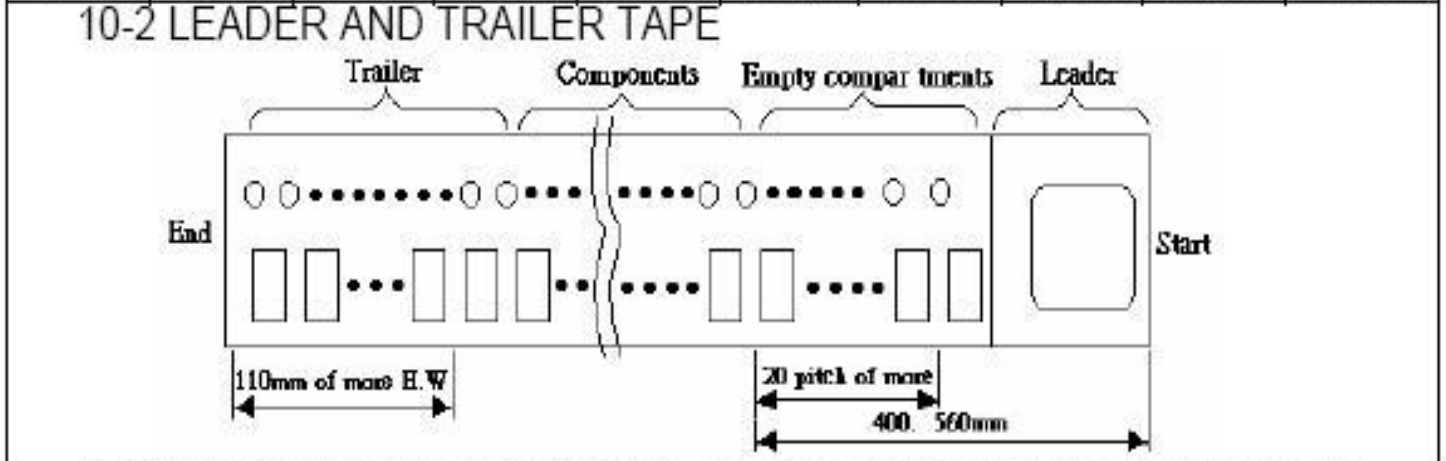
The reliability test customers if there are special requirements in accordance with customer needs.

◆ PAPER CARRIER TYPE PACKING

TYPE : HALVS



A	B	C	D	E	F	G	H	J	T
1.03	1.85	8.00	3.50	1.75	4.00	2.00	4.00	1.55	0.95
±0.05	±0.05	±0.10	±0.05	±0.10	±0.10	±0.05	±0.10	±0.05	±0.05



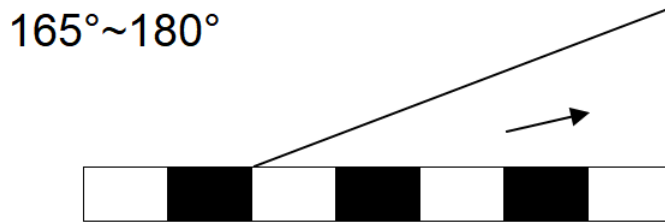
10-4 REELS

UNIT:mm

A	178 ±2.0
N	50 MIN
W1	10 ±1.5
W2	20 MAX

PACKING QTY.
4,000 PCS REEL

Cover tape	(10g~100g)
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◆ Test condition

1. peel angle : 165°~180° vs carrier tape
2. peel speed : 300mm/min

11. Packaging

1. Tape & Reel packaging in composite specification 6/8
2. Reel and a bag of desiccant shall be packed in Nylon or plastic bag
3. Maximum of 5 reels shall be packaged in a inner box
4. Maximum of 6 inner box shall be packaged in a outer box

12. Reel Label

Producing the goods label needs to indicate (1) Pb Free (2) RoHS Compliant

13. Storage

13-1 The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to high humidity. Packages must be stored at 40°C or less and 70% RH or less.

13-2 The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust or harmful gas (hydrogen chloride, sulfurous acid gas or hydrogen sulfide).

13-3 Packaging material may be deformed if packages are stored where they are exposed to heat or direct sun-light.

13-4 Minimum packages, such as polyvinyl heat – seal packages shall not be opened until just before they are used. If opened, use the reels as soon as possible.

13-5 Solderability specified in composite specification 4/8 shall be for 12 months from the date of delivery on condition that they are stored at the environment specified clause 13-1 & 13-2. For those parts which passed more than 6 months shall be checked solderability before it is used.

14. Quality System

TYPE : HALVS

- ◆ **ISO/IATF16949**
- ◆ **IECQ QC 080000**
- ◆ **AEC-Q200 COMPLIANT**
- ◆ **AUTOMOTIVE QUALITY**