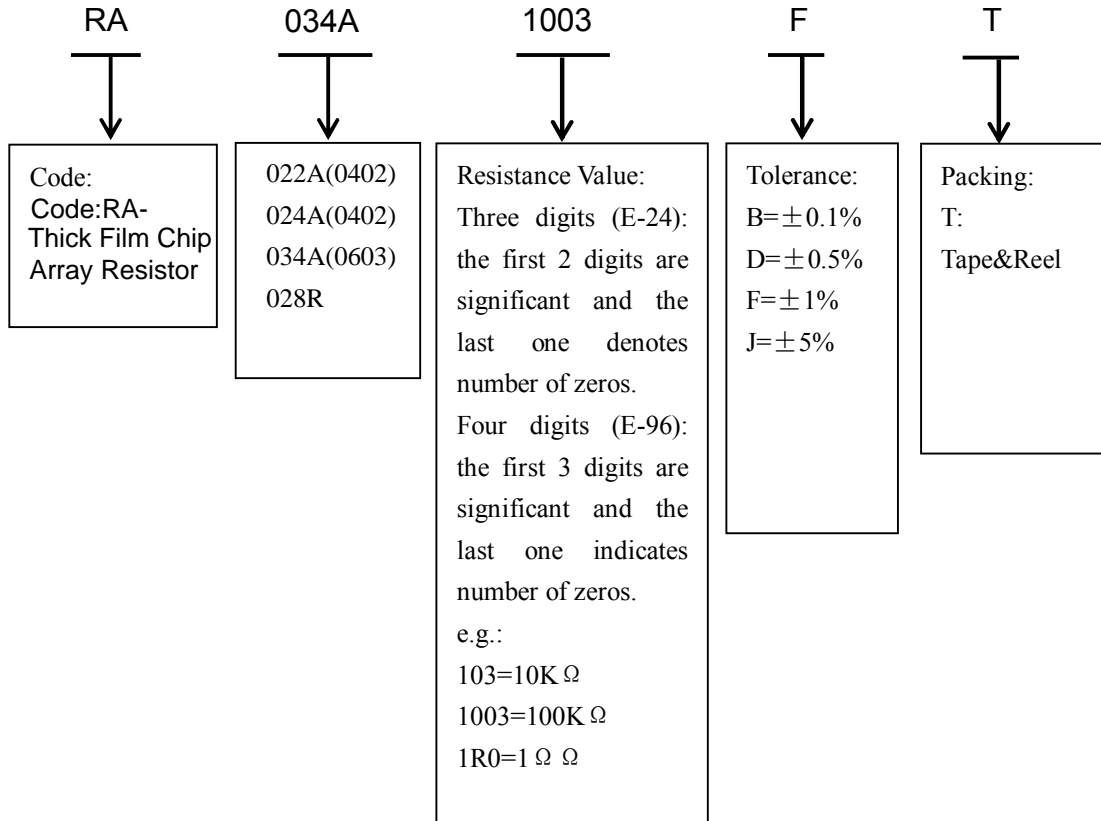
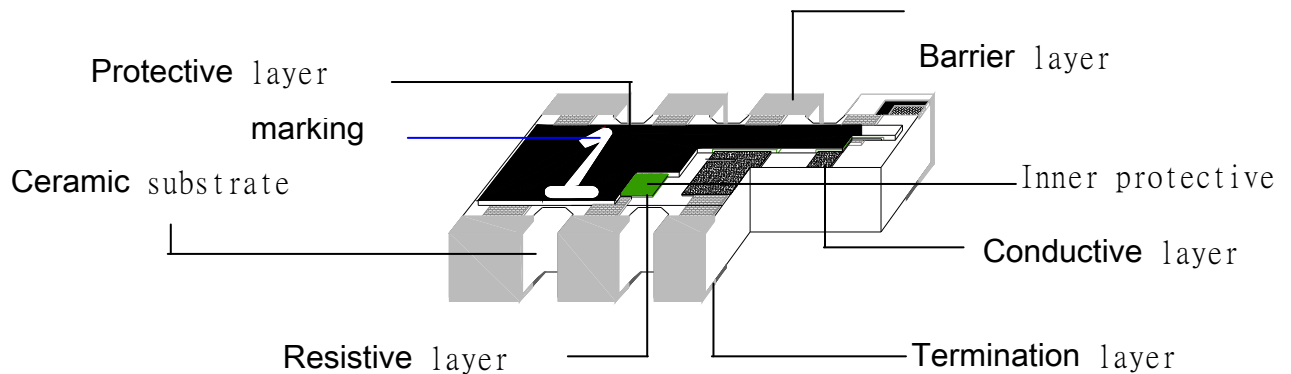


## 1. PART NUMBER

e.g.: RA034A1003FT



## 2. STRUCTURE

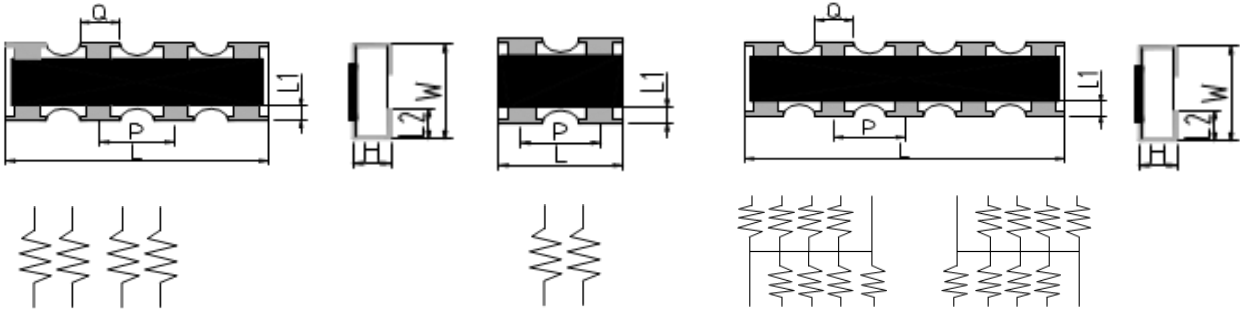


### 3. Dimension and Electrical Parameters

RA024A (8Pin 4R)  
RA034A(8Pin 4R)

RA022A(4Pin 2R)

RA028R/L (10Pin 8R)



TYPE	L	W	H	L1	Q	P	L2
RA022A	1.00±0.10	1.00±0.10	0.35±0.05	0.19±0.10	0.33±0.10	0.67±0.10	0.28±0.10
RA024A	2.00±0.10	1.00±0.10	0.40±0.05	0.18±0.10	0.33±0.10	0.50±0.10	0.26±0.10
RA034A	3.20±0.20	1.50±0.20	0.55±0.05	0.30±0.15	0.50±0.15	0.80±0.15	0.30±0.20
RA028R/L	3.30±0.20	1.50±0.20	0.55±0.05	0.35±0.20	0.33±0.15	0.70±0.15	0.35±0.20

#### Electrical characteristics

Size	Power Rating 70°C	Max working Voltage	Max Overload Voltage	T.C.R (ppm/°C)	Resistance Range				0ohm Jumper	Zero Resistance Max Current
					D(±0.5%) E96	F(±1%) E96	G(±2%) E24	J(±5%) E24		
RA022A RA024A RA028	1/16W	50 V	100V	+500~-250	-----	1Ω~10Ω	1Ω~10Ω	1Ω~10Ω	50mΩ MAX	1A
				±200	-----	-----	10Ω~10MΩ	10Ω~22MΩ		
				±100	-----	10Ω~10MΩ	-----	-----		
RA034A	1/10W	50V	100V	+500~-250	-----	1Ω~10Ω	1Ω~10Ω	1Ω~10Ω	50mΩ MAX	1A
				±200	-----	-----	10Ω~10MΩ	10Ω~22MΩ		
				±100	10Ω~1MΩ	10Ω~10MΩ	-----	-----		

## 4. MARKING

### 4.1 Marking for $R \geq 1\Omega$

- For 0201 and 0402, there is no marking on the body for the small dimension.
- For 0.1%, 0.5% and 1% resistor, there is 4-digit marking on the body, in which the first 3 digits are significant and the last one indicates number of zeros.

e.g.:  $1003 = 100 \times 10^3 = 100 \times 1000 = 100000\Omega = 100K\Omega$

$4703 = 470 \times 10^3 = 470 \times 1000 = 470000\Omega = 470K\Omega$

$22R1 = 22.1\Omega$  (R is decimal point)

$1R30 = 1.3\Omega$  (R is decimal point, add 0 as the fourth digit if there are only 3 digits)



- For 2% and 5% resistor, there is 3-digit marking on the body, in which the first 2 digits are significant and the last one indicates number of zeros.

e.g.:  $103 = 10 \times 10^3 = 10 \times 1000 = 10000\Omega = 10K\Omega$

$473 = 47 \times 10^3 = 47 \times 1000 = 47000\Omega = 47K\Omega$

$1R3 = 1.3\Omega$  (R is decimal point)



- For 0603 0.1%, 0.5% and 1% resistor, the marking is E96 code (three digits).

e.g.:  $02C = 102 \times 10^2 = 102 \times 100 = 10200\Omega = 10.2K\Omega$

$15E = 140 \times 10^4 = 140 \times 10000 = 1400000\Omega = 1.4M\Omega$



- For special values with tolerance 0.1%, 0.5% and 1% in 0603 size, which belong to E-24 series but not E-96 series, the marking is the same with that for 5% but underlined.

e.g.: 124 = 120K



### 4.2 Marking for $R < 1\Omega$

- For 0201 and 0402, there is no marking on the body for the small dimension.

- For 0.1%, 0.5% and 1% resistor, there is 4-digit marking on the body, R is the decimal point

e.g.:  $R200 = 0.2\Omega$

$R002 = 0.002\Omega$



- For 2% and 5% resistor, there is 3-digit marking on the body, R is the decimal point

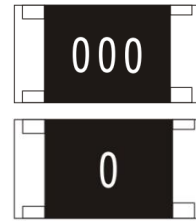
e.g.:  $R20 = 0.2\Omega$

$R02 = 0.02\Omega$



### 4.3 Marking for R=0Ω

- There is no marking for 0201 and 0402.
- Marking for 0603, 0805, 1206, 1210, 2010 and 2512 is one or three zeros.



### E-96 Code (0603)

Code	A	B	C	D	E	F	G	H	X	Y	Z
Zero number	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>

Value (Ω)	Code	Value (Ω)	Code	Value (Ω)	Code	Value (Ω)	Code
100	01	178	25	316	49	562	73
102	02	182	26	324	50	576	74
105	03	187	27	332	51	590	75
107	04	191	28	340	52	604	76
110	05	196	29	348	53	619	77
113	06	200	30	357	54	634	78
115	07	205	31	365	55	649	79
118	08	210	32	374	56	665	80
121	09	215	33	383	57	681	81
124	10	221	34	392	58	698	82
127	11	226	35	402	59	715	83
130	12	232	36	412	60	732	84
133	13	237	37	422	61	750	85
137	14	243	38	432	62	768	86
140	15	249	39	442	63	787	87
143	16	255	40	453	64	806	88
147	17	261	41	464	65	825	89
150	18	267	42	475	66	845	90
154	19	274	43	487	67	866	91
158	20	280	44	499	68	887	92
162	21	287	45	511	69	909	93
165	22	294	46	523	70	931	94
169	23	301	47	536	71	953	95
174	24	309	48	549	72	976	96

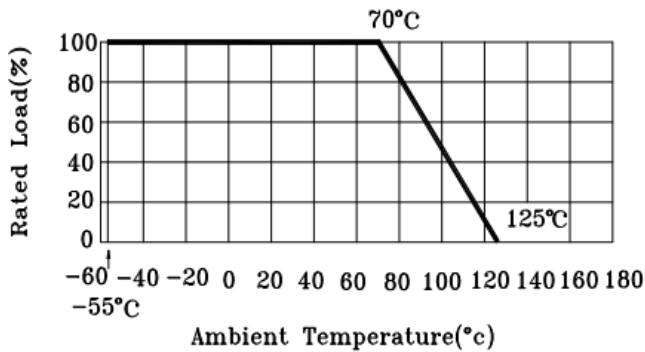
## 4.4 TOLERANCE RANGE

Size	Tolerance(%)	Symbol	Resistance Range	Standard Resistance Values
RA022A /RA024A RA034A/ RA028R/L	±1%	F	10ohm~1M	E96
	±2%	G		
	±5%	J	1.0ohm~1M	E24
	±10%	K		
	±20%	M		

## 5. POWER RATING

Ambient temperature The rated power of each type below 70° C is as follows. When the temperature exceeds 70° C, the resistance power decays.

TYPE	Rated Power	Max. Working Voltage	Max. Overload Voltage
RA022A(4P2R)	1/16W	50	100V
RA024A(8P4R)	1/16W	50	100V
RA034A(8P4R)	1/10W	50V	100V
RA028R(10P8R)	1/16W	25V	50V



## 6. TEST METHODS

6.1 Resistance Value: Use high-precision measurement equipment to measure the resistance value by 4-wire test technology. The standard test voltages are as below:

Test Voltage

1Ω~100Ω	0.3V
100Ω~1KΩ	1V
1KΩ~10KΩ	3V
10KΩ~100KΩ	10V
100KΩ~1MΩ	25V
1MΩ~10MΩ	50V
10MΩ 以上	100V

### 6.2 Voltage Ratings

Formula for rated voltage:  $E = \sqrt{RP}$

E: Rated Voltage (V)

P: Rated Power (W) R: Resistance Value (ohm)

If E is higher than the max working voltage in Form 3.1, then the rated voltage is the max working voltage.

### 6.3 TCR

Solder the resistor on the test board and then test according the following steps. Formula for TCR:

$$TCR(\text{ppm}/^{\circ}\text{C}) = \frac{R - R_0}{R} * \frac{1}{t - t_0} * 10^6$$

R= Resistance Under Specified Temperature

R0= Resistance Under Room Temperature

t= Specified Test Temperature

t0 = Room Temperature

STEP	TEMPERATURE
1	25±5℃
2	125±5℃

### 6.4 Short-time Overload

Solder the resistor on the test board and charge 2.5x rated voltage for 5s. If the charged voltage is higher than the max overload voltage, then take the max overload as standard. Measure the resistance value according the steps specified in 7.1.1. Please see the formulas below:

$$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\% \text{-----}(\%)$$

R1=Resistance before test (Ω)

R2=Resistance after test (Ω)

### 6.5 Withstand Voltage

Charge the max overload voltage to the insulation layer of the tested resistor for 1 minute, and then check if it is broken down. Increase the voltage until it is broken down and record this voltage.

## 7. Mechanical test

### 7.1 Anti-soldering heat

Resistor 260°C±5°C

The resistor dip in the tin heater, 10 seconds, according to the testing resistance 7.1.1, the count method is as below:

$$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----}(\%)$$

R1= Resistance before testing (Ω)

R2= Resistance after testing (Ω)

### 7.2 Solderability

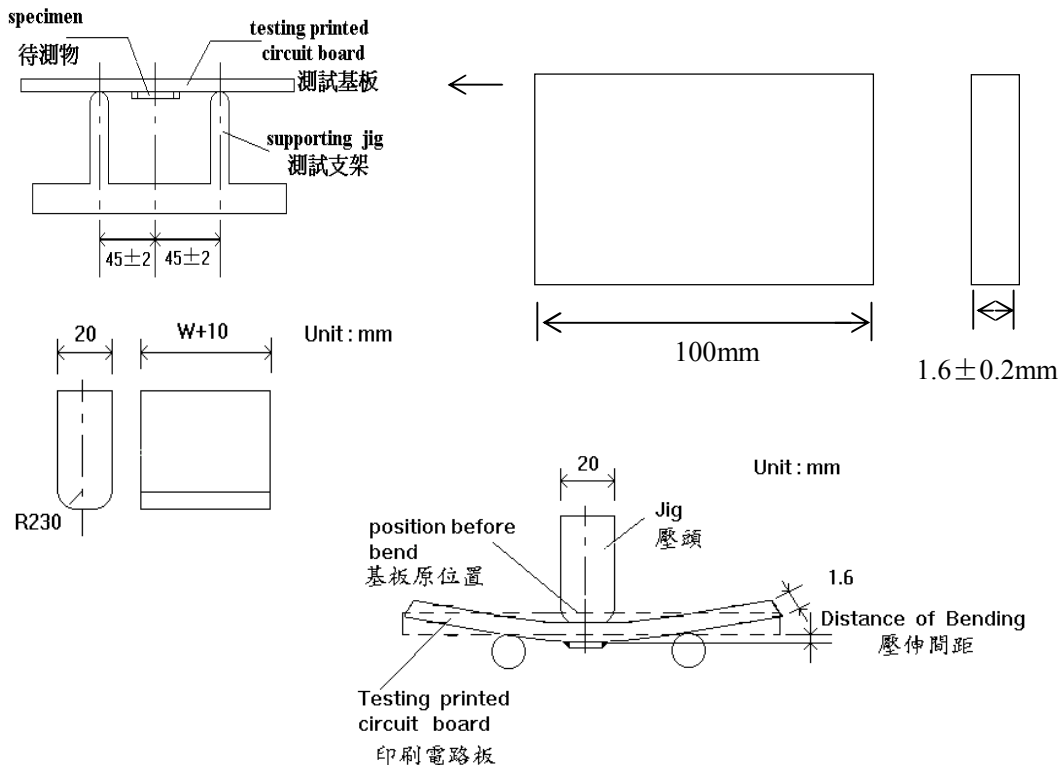
when the resistor terminal wis immersed in the soldering flux , dip in the tin heater 2 or 3 seconds, check the soldering area.

### 7.3 Bonding test

Test method : JIS C 5202 6.1.4 the resistor soldering on the testing board, follow the below standard to operate:

Category	Time (second)	Bend degree +0.20(mm)
SMD Resistor	5±1	5 or 2 (according the spec)
High power resistor	5±1	2
Network resistor	5±1	1

Picture of bonding test board:



### 7.4 Environment performance test:

#### 7.4.1 Low temperature operation test:

Test method: Following MIL-STD-55342D PARA 4.7.4,

The resistor soldering on the testing board, put it into low temperature box  $-65\pm 0.5\text{ }^{\circ}\text{C}$ , after an hour add the rated voltage about  $45\pm 0.5$  minute. Took place after 24 hours; Then following 7.1.1 testing result and count it as below steps:

$$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\text{-----}(\%)$$

R1=Resistance before testing . ( $\Omega$ )

R2=Resistance after testing ( $\Omega$ )

7.4.2 When the temperature-humidity cycling resistor soldering on the testing board, put into the testing box and add the rated voltage; Following the 7.1.1 testing result and count it as below step:

Cycle	1	2	3	4	5	6	7	8	9	10	11
Temperature( $^{\circ}\text{C}$ )	65	65	25	65	65	25	25	-10	-10	25	25
Moisture (%)	92	92	92	92	92	92	92	0	0	0	92
Time (H:m)	2:30	3:00	2:30	2:30	3:00	2:30	1:30	0:30	3:00	0:30	2:30

$$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\text{-----}(\%)$$

#### 7.4.3 Moisture feature

The resistor soldering on the testing board, put it into the RH 90-95% testing box, add the rated voltage, power up about 30mins, power down about 30mins, cycling 1000  $\pm 24/0$  hours; Following the testing result 7.1.1, count it as below step:

$$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\text{-----}(\%)$$

R1=Resistance before testing . ( $\Omega$ )

R2=Resistance after testing ( $\Omega$ )

#### 7.4.4 Load life

Test method: MIL-STD-202F METHOD 108A Test method

The resistor soldering on the testing board, put into the testing box within  $70\pm 2^{\circ}\text{C}$ , add the rated voltage 1000 within  $\pm 24/0$  hours; Following the 7.1.1 testing result, count it as below:



$$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----}(\%)$$

R1=Resistance before testing . (Ω)

R2=Resistance after testing (Ω)

### 7.4.5 Thermal shock test

Test method: MIL-STD-202F      METHOD      107G

Put the resistor into thermal shock box, following the standard as below:

Test sequence	1	2	3	4
Test temperature (°C)	-55±3°C	Temperature changed	125±2	Temperature haged
Time	2Min	10Sec	2	10Sec
Cycle	5			

Testing result, and count it as below:

$$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----}(\%)$$

R1=Resistance before testing . (Ω)

R2=Resistance after testing (Ω)

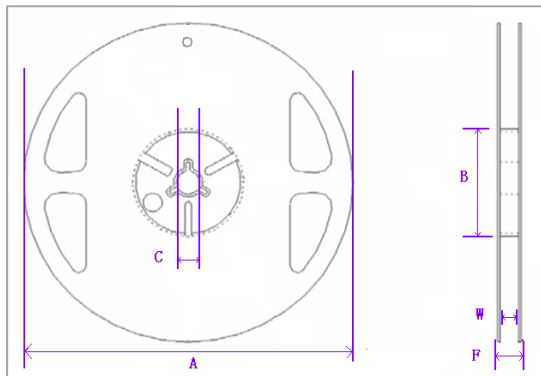
## 8. Reliability test

Items	Spec	Test method
Temperature features	(over10ohm) ±200 ppm/°C Max.	JIS C52025.2
	(lower10ohm) +500~-250 ppm/°C	
Short time overload	±(1.00%+0.05ohm) Max.	JIS C52025.5
Anti-soldering heat	±(1.00%+0.05ohm)Max.	JIS C52026.4
Solderability	95%CoverageMin.	JIS C52026.4
Load life	±(3.00%+0.05ohm)Max.	JISC52027.10
Moisture feature	±(2.00%+0.05ohm)Max.	JIS C52027.5
Temperature cycle	±(2.00%+0.05ohm)Max.	JIS C52027.6
Heat test	±(1.00%+0.05ohm) Max.	<260°C 10 seconds/ 3times
Soldering heat by manual	The iron don't touch the resistor	Approx.350°C for3seconds
MSL (moisture sensitive level)	Level 1	J-STD-020C

## 9. Packing

### Reel

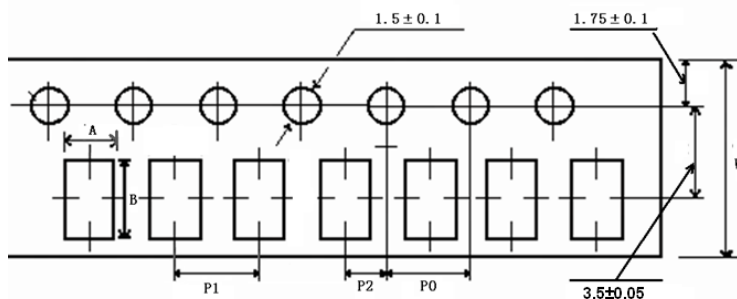
尺寸		A	B	C	F	W
RA022A	mm	180.0±3.0	60.0±1.0	13.0±0.3	11.7±0.3	9.00±0.3
RA024A						
RA034A	Inch	7.087±0.118	2.362±0.039	0.512±0.012	0.461±0.012	0.354±0.012
RA028R/L						



Remark: (1) RA024A/RA022A Q'ty 10000 pcs/Reel  
 (2) RA034A/RA028R Q'ty 5000pcs/Reel

### Tape

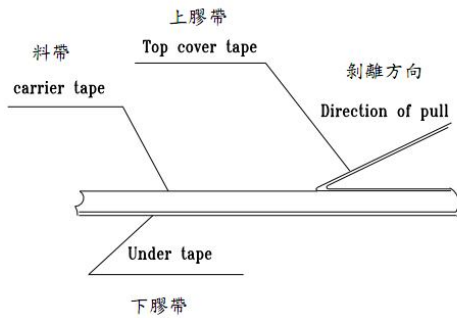
TYPE	A	B	W	P0	P1	P2
RA028R	1.90±0.25	3.60±0.20	8.00±0.20	4.00±0.10	4.00±0.10	2.00±0.05
RA034A	1.90±0.15	2.40±0.20	8.00±0.20	4.00±0.10	4.00±0.10	2.00±0.05
RA024A	1.20±0.10	2.20±0.10	8.00±0.20	4.00±0.10	2.00±0.10	2.00±0.05
RA022A	1.20±0.20	1.15±0.20	8.00±0.20	4.00±0.10	2.00±0.10	2.00±0.05



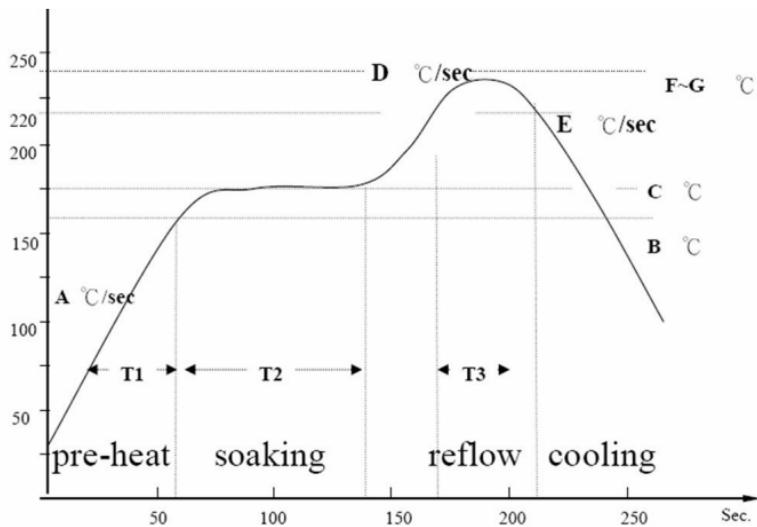
## 10. Other Parameter

### 10.1 Tape stripping test:

The range of tape stripping is 0.1N—0.7N (10 to 70 gf), top tape stripping speed is 200mm/min, the degree should be in 165 – 180 degree between the tape and paper tape after stripped; Please refer the picture as below



### 10.2 Suggestion for re-flow soldering temperature;



- A: ramp up rate during preheat 1.0-3.0 °C/sec
- B-C:soaking temperature 155-185°C
- D:ramp up rate during reflow 1.2-2.3 °C/sec
- E:ramp down rate during cooling 1.0-6.0 °C/sec
- F-G: peak temperature 230-250 °C
- T1:preheat time 50-80 sec
- T2:dwel time during soaking 60-120 sec
- T3:time above 220 °C 20-40sec