

## Data Sheet

Customer :

Product : Automotive Grade Professional Thin Film Chip Resistor– ART..A Series

Size: 0402/0603/0805/1206

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## Automotive Grade Professional Thin Film Chip Resistor (ART..A Series)



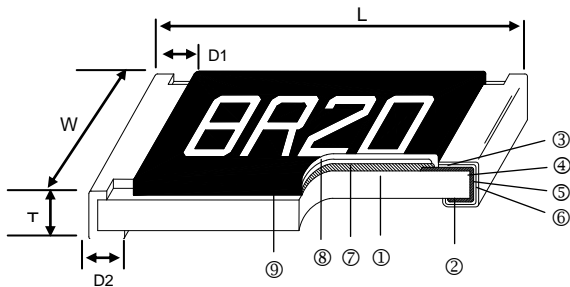
### ■ Features

- Operating temperature up to 175°C for 1000 h
- Rated dissipation  $P_{85}$  up to 0.4W for size 1206
- AEC-Q200 Qualified
- Superior temperature cycling robustness
- Advanced sulfur resistance verified according to ASTM B 809

### ■ Applications

- Automotive
- Telecommunication
- Medical equipment
- Industrial equipment

### ■ Construction



① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Marking

### ■ Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ART02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.54
ART03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.83
ART05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.20	4.71
ART06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	9.02

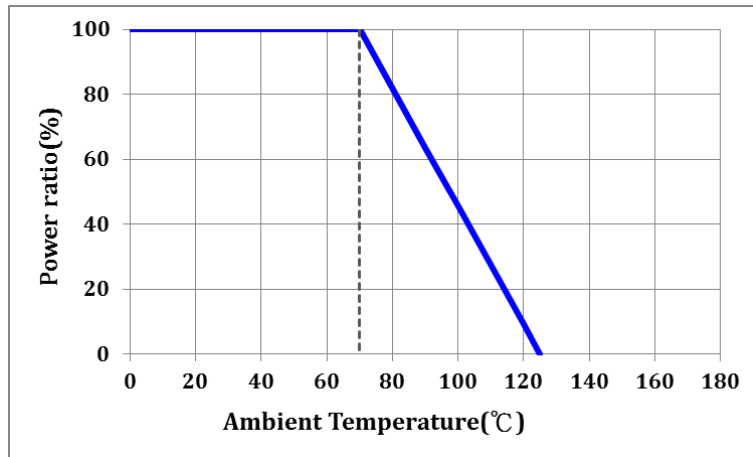
### ■ Part Numbering

<b>ART</b>	<b>03</b>	<b>B</b>	<b>T</b>	<b>C</b>		<b>1001</b>	<b>A</b>
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206	B: ±0.1% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	: Standard* (See Remark)	0100: 10Ω 10R2: 10.2Ω 1000: 100Ω 1001: 1KΩ 1002: 10 KΩ 1003: 100KΩ 1004: 1M Ω	A: Automotive Grade NA: No Marking Automotive Grade

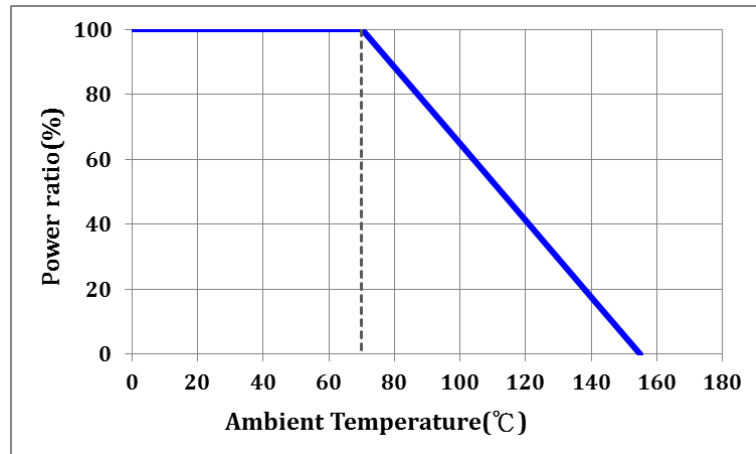
\*Remark: Standard part no need for power rating code.

■ Functional Performance

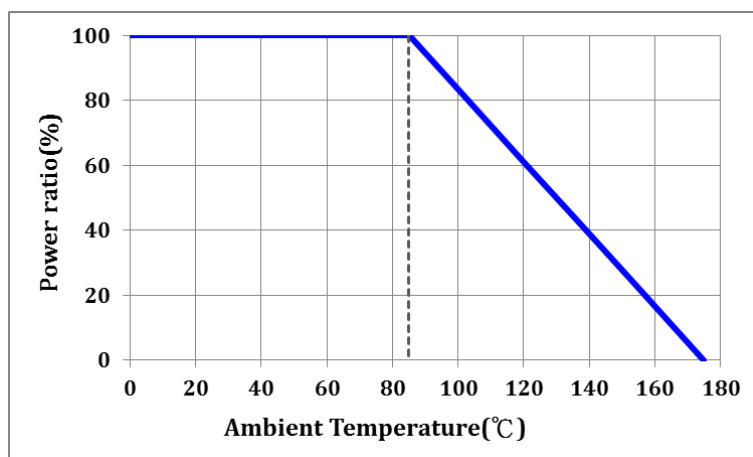
Derating-Standard Operation



Derating- Power Operation

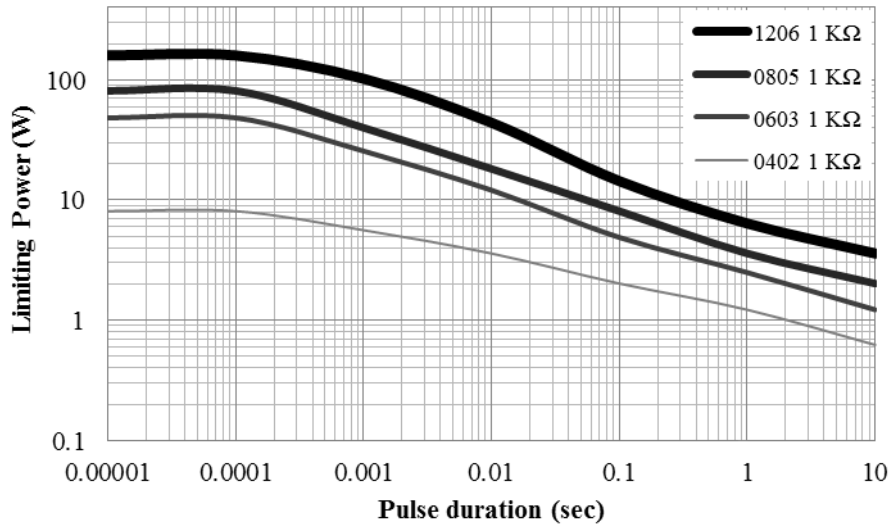


Derating- Advanced Power Operation

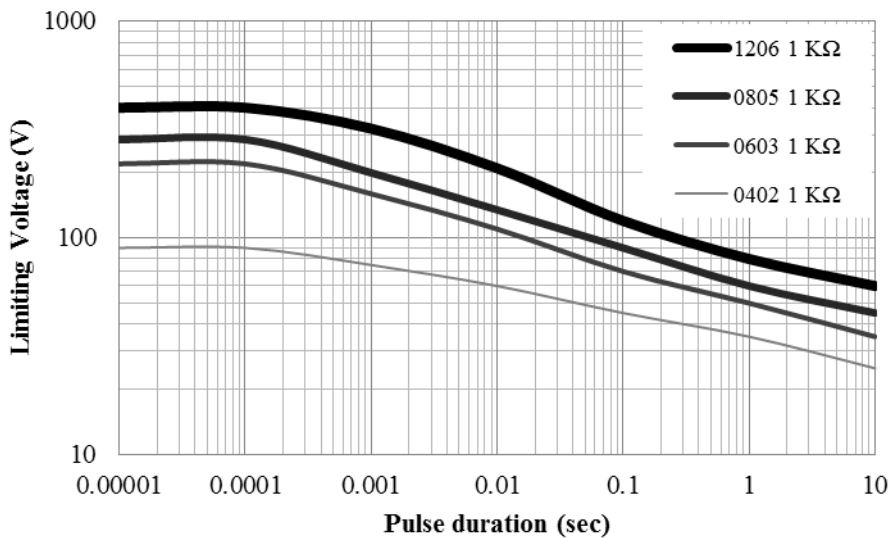


■ Functional Performance

Single pulse



Pulse Voltage



**■ Standard Electrical Specifications**

Type	Item	Power Rating at 85°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
						±0.1%	±0.5%	±1%	
ART02		1/10W	-55 ~ +175°C	50V	100V	49.9Ω – 221KΩ			±25,±50
ART03		3/20W	-55 ~ +175°C	75V	150V	10Ω – 511KΩ			±25,±50
ART05		1/5W	-55 ~ +175°C	150V	300V	10Ω – 1MΩ			±25,±50
ART06		2/5W	-55 ~ +175°C	200V	400V	10Ω – 1MΩ			±25,±50

**■ Maximum Resistance Change at Rated Dissipation**

Operation Mode		Standard P <sub>70</sub>	Power P <sub>70</sub>	Advanced Temperature P <sub>85</sub>
Rated dissipation	ART02	0.063W	0.100W	0.100W
	ART03	0.100W	0.125W	0.150W
	ART05	0.125W	0.200W	0.200W
	ART06	0.250W	0.400W	0.400W
Operating temperature range		-55 ~ 125°C	-55 ~ 155°C	-55 ~ 175°C
Permissible film temperature		125°C	155°C	175°C
Max. resistance change at rated dissipation for resistance range,  ΔR/R  after:	ART02	49.9Ω – 221KΩ	49.9Ω – 221KΩ	49.9Ω – 221KΩ
	ART03	10Ω – 511KΩ	10Ω – 511KΩ	10Ω – 511KΩ
	ART05	10Ω – 1MΩ	10Ω – 1MΩ	10Ω – 1MΩ
	ART06	10Ω – 1MΩ	10Ω – 1MΩ	10Ω – 1MΩ
	1000hr	≤ 0.15%	≤ 0.3%	≤ 0.5%
	8000hr	≤ 0.25%	≤ 0.5%	—

Operating Voltage= $\sqrt{P \cdot R}$  or Max. operating voltage listed above, whichever is lower.  
 Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$  or Max. overload voltage listed above, whichever is lower.  
 ■ Viking is capable of manufacturing the optional spec based on customer's requirement.

**Environmental Characteristics**

Item	Requirement		Test Method	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		<b>MIL-STD-202 Method 304</b> +25/-55/+25/+125/+25°C	
Short Time Overload (Standard operation mode)	$\Delta R \pm 0.10\%$		<b>JIS-C-5201-1 4.13</b> RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds	
Short Time Overload (Power operation mode)	$\Delta R \pm 0.25\%$			
Insulation Resistance	>1000 M $\Omega$		<b>MIL-STD-202 Method 302</b> Apply 100V <sub>DC</sub> for 1 minute	
Endurance	Standard at 70°C	1000hrs	$\Delta R \pm 0.15\%$	<b>MIL-STD-202 Method 108</b> RCWV with 1.5 hrs "ON" and 0.5 hrs "OFF"
		8000hrs	$\Delta R \pm 0.25\%$	
	Power at 70°C	1000hrs	$\Delta R \pm 0.3\%$	
		8000hrs	$\Delta R \pm 0.5\%$	
Advanced temperature at 85°C	1000hrs	$\Delta R \pm 0.5\%$		
High Temperature Exposure	125°C	$\Delta R \pm 0.15\%$		<b>EN 60115-1 CLAUSE 4.25.3</b> 1000 hrs
	155°C	$\Delta R \pm 0.3\%$		
	175°C	$\Delta R \pm 0.5\%$		
Temperature Cycling	$\Delta R \pm 0.25\%$		<b>JESD22 Method JA-104</b> 30 min at -55 °C and 30 min at 155 °C; , 1000 cycles	
Biased Humidity	Standard operation mode $\Delta R \pm 0.5\%$		<b>MIL-STD-202 Method 103</b> 1000hrs 85°C/85%RH 10% of operating power ( $\leq 100$ V)	
Bending Strength (Board Flex)	$\Delta R \pm 0.1\%$		<b>JIS-C-5201-1 4.33</b> Bending once for 60 seconds Bending displacement: 0402 0603 0805 1206 sizes: 3 mm	
Solderability	95% min. coverage		<b>JIS-C-5201-1 4.17</b> <b>IEC-60115-1 4.17</b> 245 $\pm$ 5°C for 3 seconds	
Resistance to Soldering Heat	$\Delta R \pm 0.1\%$		<b>JIS-C-5201-1 4.18</b> <b>IEC-60115-1 4.18</b> 260 $\pm$ 5°C for 10 seconds	
Terminal strength	No broken		<b>AEC-Q200-006</b> 0402 0603: Force of 1kg for 60 seconds. Others: Force of 1.8kg for 60 seconds.	
Mechanical Shock	$\Delta R \pm 0.1\%$		<b>MIL-STD-202 Method 213</b> Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.	
Vibration	$\Delta R \pm 0.1\%$		<b>MIL-STD-202 Method 204</b> 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz	
ESD	$\Delta R \pm 0.5\%$		<b>AEC-Q200-002</b> Human body model AR02 0.4KV AR03 1KV AR05 1.5KV AR06 2KV	
Resistance to solvents	Marking Unsmearred		<b>MIL-STD-202 Method 215</b> Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.	
Flammability	No ignition of the tissue paper or scorching or the pinewood board		<b>UL-94</b> V-0 or V-1 are acceptable. Electrical test not required.	
External Visual	No visible damage.		<b>MIL-STD-883 Method 2009</b> Electrical test not required. Inspect device construction, marking and workmanship.	

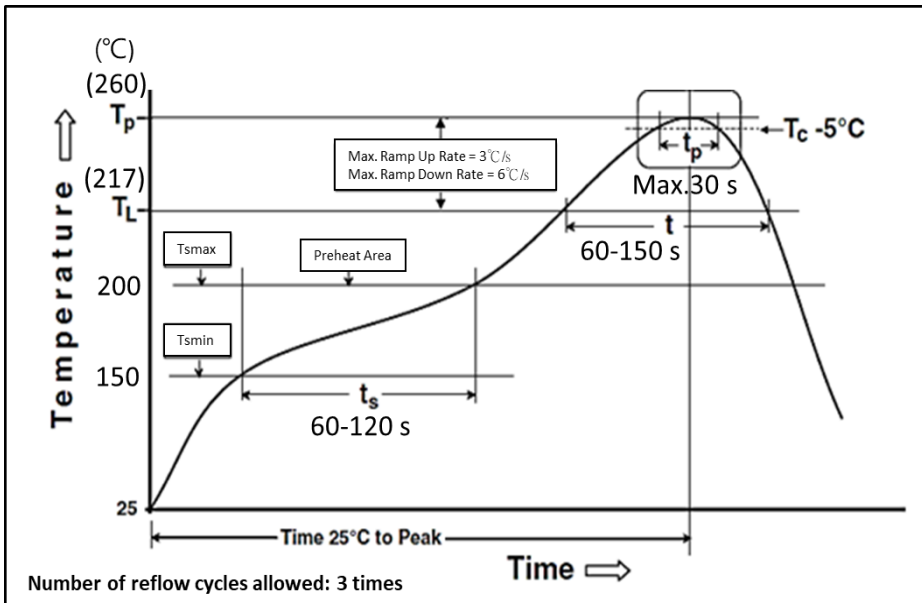
Physical Dimension	As Spec.	<b>JESD22 Method JB-100</b> Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers Specification. Electrical test not required.
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RCWV(Rated continuous working voltage)=  $\sqrt{(P \cdot R)}$  or Max. Operating voltage whichever is lower

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date.

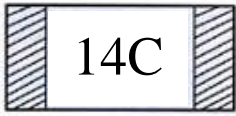
**■Soldering Condition(IPC/JEDEC J-STD-020)**



Profile Feature	Pb-Free Assembly
<b>Preheat</b>	
Min. Temperature ( $T_{smin}$ )	150 °C
Max Temperature ( $T_{smax}$ )	200 °C
Preheating time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ )	60-120 seconds
Ramp-up rate ( $T_L$ to $T_p$ )	3 °C/second max.
Liquidous temperature ( $T_L$ )	217 °C
Time ( $t$ ) maintained above $T_L$	60-150 seconds
Min. Peak temperature ( $T_p$ min)	235°C
Max. Peak temperature ( $T_p$ max)	260°C
Time ( $t_p$ ) within 5 °C of the specified classification temperature ( $T_c$ )	30 seconds max.
Ramp-down rate ( $T_p$ to $T_L$ )	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

**Marking**

0603 3digit marking



3digit marking for Example: 14C=13K7Ω 13C=13K3Ω  
68B=4K99Ω 68X=49.9Ω

0603 3digit marking for E24

Example: 101=100Ω 102=1KΩ

E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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0805~1206 4digit marking

Example

Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
marking	1000	2201	1002	4992	1003

**Marking Table**

Code	E96	Code	E96	Code	E96	Code	E96				
01	100	25	178	49	316	73	562				
02	102	26	182	50	324	74	576				
03	105	27	187	51	332	75	590				
04	107	28	191	52	340	76	604				
05	110	29	196	53	348	77	619				
06	113	30	200	54	357	78	634				
07	115	31	205	55	365	79	649				
08	118	32	210	56	374	80	665				
09	121	33	215	57	383	81	681				
10	124	34	221	58	392	82	698				
11	127	35	226	59	402	83	715				
12	130	36	232	60	412	84	732				
13	133	37	237	61	422	85	750				
14	137	38	243	62	432	86	768				
15	140	39	249	63	442	87	787				
16	143	40	255	64	453	88	806				
17	147	41	261	65	464	89	825				
18	150	42	267	66	475	90	845				
19	154	43	274	67	487	91	866				
20	158	44	280	68	499	92	887				
21	162	45	287	69	511	93	909				
22	165	46	294	70	523	94	931				
23	169	47	301	71	536	95	953				
24	174	48	309	72	549	96	976				
Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	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>

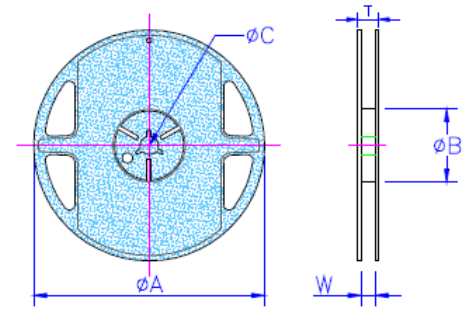


**■ Packaging**

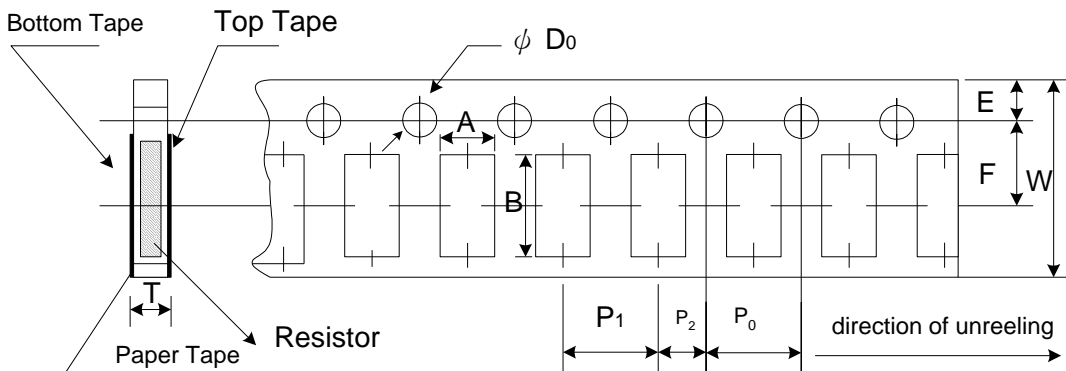
Packing Quantity & Reel Specifications

Unit : mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
ART02	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
ART03	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ART05	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ART06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-



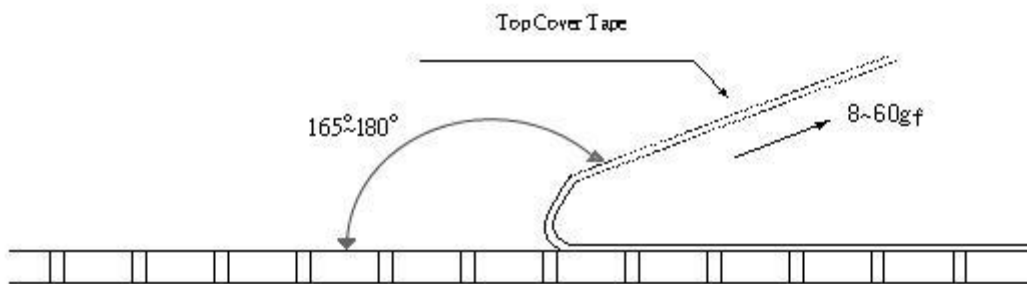
Paper Tape Specifications



Unit: mm

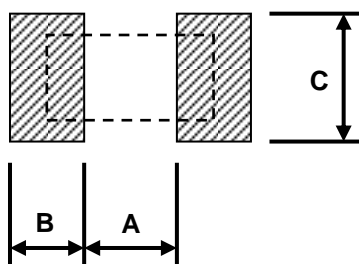
Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
ART02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
ART03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ART05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
ART06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.10	1.55±0.05	0.75±0.05

- Peel force of top cover tape
- The peel speed shall be about 300mm/min±5%
- The peel force of top cover tape shall be between 8gf to 60gf



**■ Recommend Land Pattern**

Unit: mm



Type	A	B	C
ART02	0.50	0.50	0.60±0.2
ART03	0.80	1.00	0.90±0.2
ART05	1.00	1.00	1.35±0.2
ART06	2.00	1.15	1.70±0.2