



# LEAN GIMN ENTERPRISE CO., LTD.

## Date Sheet

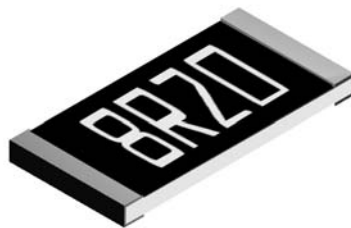
Customer :

Product Type: Thin Film Precision Chip Resistor

Part No.: AR Series

Issued Date: 05-Sep-08

Document No AR Series REV.B8



Produced by (QC)	Checked (QC)	Approved by (QC)	Prepared by (Sales)	Accepted by (Customer)
05-Sep-08	05-Sep-08	05-Sep-08	05-Sep-08	
<b>Chun</b>				

## Thin Film Precision Chip Resistor ( AR Series )

### 1. Scope

This specification applies to all sizes of rectangular-type fixed chip Resistor with Ni/Cr as material.

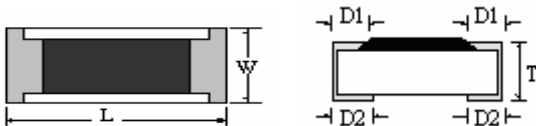
### 2. Features

- Thin film passivated NiCr resistor
- Very tight tolerance down to  $\pm 0.01\%$
- Extremely low TCR down to  $\pm 5 \text{ PPM}/^\circ\text{C}$
- Wide resistance range 1ohm ~ 3Meg ohm
- Miniature size 0201 available

### 3. Applications

- Medical Equipment
- Testing / Measurement Equipment
- Consumer Product
- Printer Equipment
- Automatic Equipment Controller
- Converters
- Communication Device, Cell phone, GPS, PDA

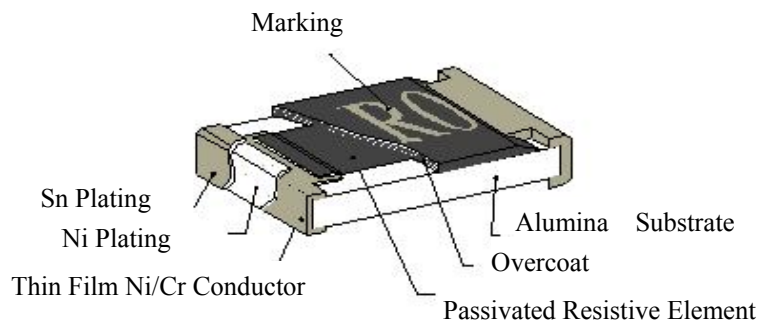
### 5. Dimensions



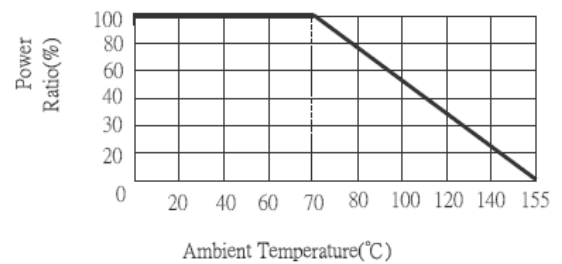
Unit : mm

Codes	L	W	T	D1	D2
AR01	0.58 $\pm$ 0.05	0.29 $\pm$ 0.05	0.23 $\pm$ 0.05	0.12 $\pm$ 0.05	0.15 $\pm$ 0.05
AR02	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.30 $\pm$ 0.05	0.20 $\pm$ 0.10	0.20 $\pm$ 0.10
AR03	1.55 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20
AR05	2.00 $\pm$ 0.15	1.25 $\pm$ 0.15	0.55 $\pm$ 0.10	0.30 $\pm$ 0.20	0.40 $\pm$ 0.25
AR06	3.05 $\pm$ 0.15	1.55 $\pm$ 0.15	0.55 $\pm$ 0.10	0.42 $\pm$ 0.20	0.40 $\pm$ 0.25
AR10	4.90 $\pm$ 0.15	2.40 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.30	0.50 $\pm$ 0.25
AR12	6.30 $\pm$ 0.15	3.10 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.30	0.50 $\pm$ 0.25
AR13	3.10 $\pm$ 0.15	2.40 $\pm$ 0.15	0.55 $\pm$ 0.10	0.40 $\pm$ 0.20	0.55 $\pm$ 0.25

### 4. Construction

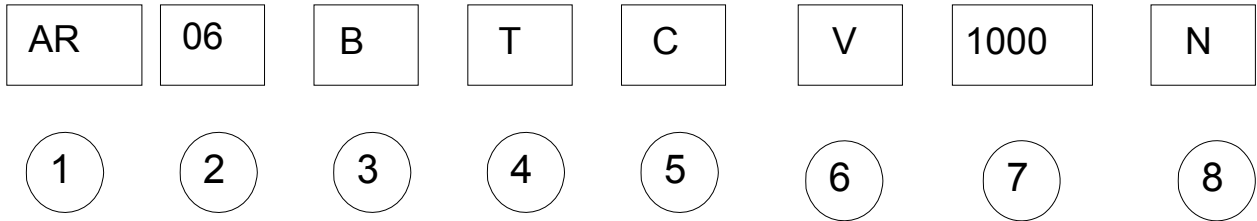


Derating Curve





## 6. Product Identification



### (1) Product Type

Product Type	
AR	Thin Film Precision Chip Resistor

### (2) Dimensions(L×W)

Codes	Dimensions (L×W)	EIA
AR01	0.58 × 0.29 mm	0201
AR02	1.00 × 0.50mm	0402
AR03	1.55 × 0.80mm	0603
AR05	2.00 × 1.25mm	0805
AR06	3.05 × 1.55mm	1206
AR10	4.90 × 2.40mm	2010
AR12	6.30 × 3.10mm	2512
AR13	3.10 × 2.40mm	1210

### (3) Resistance Tolerance

Codes	Resistance Tolerance
T	±0.01%
A	±0.05%
B	±0.10%
C	±0.25%
D	±0.50%
F	±1.00%

### (4) Packaging

Codes	Type
T	Taping Reel
B	Bulk

### (5) TCR

Codes	Type
S	±5 PPM/°C
B	±10 PPM/°C
N	±15 PPM/°C
C	±25 PPM/°C
D	±50 PPM/°C

### (6) Power Rating

Codes	Type
	Standard
T	1W
U	1/2W
O	1/3W
V	1/4W
P	1/5W
W	1/8W
X	1/10W
Y	1/16W
Z	1/32W

### (7) Resistance

Codes	Type
0010	1Ω
4R70	4.7Ω
0100	10Ω
1000	100Ω
2201	2200Ω
1002	10000Ω
4992	49900Ω
1003	100000Ω

### (8) Special

Codes	Type
	Standard
N	No Marking



## 7. Electrical Characteristics

### 7-1-1. Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max Operating Voltage	Max Overloading Voltage	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
AR01 (0201)	1/32W	-55 ~ +155°C	15V	30V	±0.5%	50Ω~5KΩ	±25 ±50
					±1.0%	5.1KΩ~33KΩ	±50
AR02 (0402)	1/16W	-55 ~ +155°C	25V	50V	±0.10% ±0.25% ±0.50%	10Ω~205KΩ	±25 ±50
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	±0.05%	4.7Ω~150KΩ	±25 ±50
					±0.10%	4.7Ω~1MΩ	
					±0.25% ±0.50%	2Ω~1MΩ	
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	±0.05%	4.7Ω~500KΩ	±25 ±50
					±0.10%	4.7Ω~2MΩ	
					±0.25% ±0.50%	1Ω~2MΩ	
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	±0.05%	4.7Ω~1MΩ	±25 ±50
					±0.10%	4.7Ω~2.5MΩ	
					±0.25% ±0.50%	1Ω~2.5MΩ	
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	±0.05%	4.7Ω~1MΩ	±25 ±50
AR12 (2512)	1/2W				±0.10%	4.7Ω~3MΩ	
					±0.25% ±0.50%	1Ω~3MΩ	
AR13 (1210)	1/5W	-55 ~ +155°C	150V	300V	±0.05%	4.7Ω~1MΩ	±25 ±50
					±0.10%	4.7Ω~2.5MΩ	
					±0.25% ±0.50%	1Ω~2.5MΩ	

\* We are capable of manufacturing the following options based on customer's requirement.

Lower Resistance: 1~10Ω



## 7-1-2. Special Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max Operating Voltage	Max Overloading Voltage	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
AR02 (0402)	1/16W	-55 ~ +155°C	25V	50V	±0.01%	49.9Ω~3KΩ	±5
					±0.05%	49.9Ω~12KΩ	±10
					±0.10%		
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	±0.01%	25Ω~15KΩ	±5
					±0.05%	25Ω~100KΩ	±10
					±0.10%		±15
					±0.10%	4.7Ω~332KΩ	±10
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	±0.01%	25Ω~30KΩ	±5
					±0.05%	25Ω~200KΩ	±10
					±0.10%		±15
					±0.05%	4.7Ω~511KΩ	±10
					±0.10%		
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	±0.01%	25Ω~50KΩ	±5
					±0.05%	25Ω~500KΩ	±10
					±0.10%		±15
					±0.10%	4.7Ω~1MΩ	±10
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	±0.01%	25Ω~100KΩ	±5
					±0.05%	25Ω~500KΩ	±10
					±0.10%		±15
					±0.10%	4.7Ω~1MΩ	±10
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	±0.01%	25Ω~100KΩ	±5
					±0.05%	25Ω~500KΩ	±10
					±0.10%		±15
					±0.10%	4.7Ω~1MΩ	±10
AR13 (1210)	1/5W	-55 ~ +155°C	150V	300V	±0.01%	25Ω~50KΩ	±5
					±0.05%	25Ω~500KΩ	±10
					±0.10%		±15
					±0.10%	4.7Ω~1MΩ	±10

## 7-2. High Power Rating Electrical Specifications

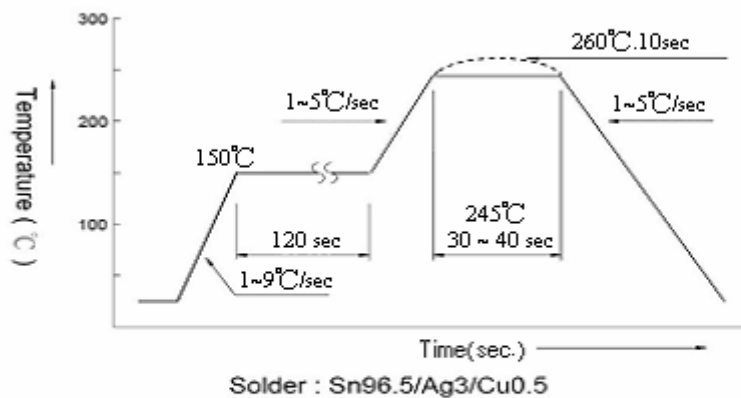
Item Type	Power Rating at 70°C	Operating Temp. Range	Max Operating Voltage	Max Overloading Voltage	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
AR03 (0603)	1/10W	-55 ~ +155°C	50V	100V	±0.10% ±0.25% ±0.50%	10Ω~332KΩ	±25 ±50
AR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	±0.10% ±0.25% ±0.50%	4.7Ω~1MΩ	±25 ±50
AR06 (1206)	1/4W	-55 ~ +155°C	200V	400V	±0.10% ±0.25% ±0.50%	4.7Ω~1MΩ	±25 ±50
AR13 (1210)	1/3W	-55 ~ +155°C	200V	400V	±0.10% ±0.25% ±0.50%	4.7Ω~1MΩ	±25 ±50

\* We are capable of manufacture the following options based on customer's requirement.

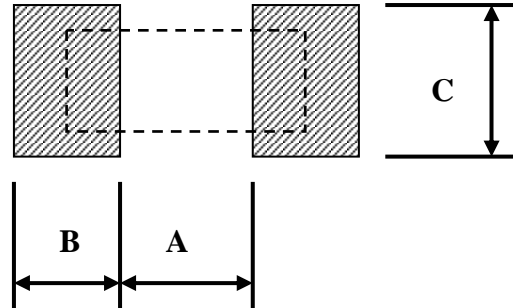
Lower Resistance: 1~10Ω; Higher Power Rating

## 8. Reflow

### Soldering profile ( Lead-free)



## 9. Recommend Land Pattern



Unit : mm

Codes	A	B	C
AR13	2.00	1.15	2.50±0.2
AR12	4.90	1.60	3.10±0.2
AR10	3.60	1.40	2.50±0.2
AR06	2.00	1.15	1.70±0.2
AR05	1.00	1.00	1.35±0.2
AR03	0.80	1.00	0.90±0.2
AR02	0.50	0.50	0.60±0.2
AR01	0.25	0.3	0.4±0.2



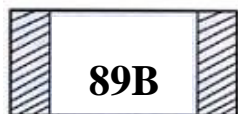
## 10. Environmental Characteristics

Test Item	Specification		Test Method
	Tol. $\leq 0.05\%$	Tol. $>0.05\%$	
Temperature Coefficient of Resistance	As Spec		<b>MIL-STD-202F Method 304</b> +25/-55/+25/+125/+25°C
Short Time Overload	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.5\%$	<b>JIS-C-5202-5.5</b> RCWV*2.5 or Max Overloading Voltage , 5 seconds
	$\Delta R \pm 0.5\%$ for high power rating		
Dielectric Withstand Voltage	By type		<b>MIL-STD-202F Method 301</b> Apply Max Overload Voltage for 1 minute
Insulation Resistance	$>1000M\Omega$		<b>MIL-STD-202F Method 302</b> Apply 100V <sub>DC</sub> for 1 minute
Thermal Shock	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.25\%$	<b>MIL-STD-202F Method 107G</b> -55°C~150°C, 100 cycles
Load Life	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	<b>MIL-STD-202F Method 108A</b> RCWV , 70°C , 1.5 hours ON , 0.5 hours OFF, total 1000~1048 hours
	$>7k\Omega \Delta R \pm 0.5\%$		
	$\Delta R \pm 0.5\%$ for high power rating		
Humidity ( Steady State )	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.3\%$	<b>MIL-STD-202F Method 103B</b> 40°C , 90~95%RH, RCWV 1.5 hours ON, 0.5 hours OFF, total 1000~1048 hours
	$\Delta R \pm 0.5\%$ for high power rating		
Resistance to Dry Heat	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	<b>JIS-C-5202-7.2</b> 96 hours @ +155°C without load
Low Temperature Operation	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	<b>JIS-C-5202-7.1</b> 1 hours, -65°C, followed by 45minutes of RCWV
	$\Delta R \pm 0.5\%$ for high power rating		
Bending Strength	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	<b>JIS-C-5202-6.1.4</b> Bending Amplitude 3mm for 10 seconds
Solderability	95%min coverage		<b>MIL-STD-202F Method 208H</b> 245°C $\pm 5^\circ\text{C}$ , 3 $\pm 0.5$ (sec)
Resistance to Soldering Heat	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	<b>MIL-STD-202F Method 210E</b> 260 $\pm 5^\circ\text{C}$ , 10 $\pm 1$ seconds

\* Storage Temperature :25 $\pm 3^\circ\text{C}$ ; Humidity <80%RH



## 11. Marking



3digit marking for Example: 14C=13K7 Ω    13C=13K3 Ω  
 68B=4K99 Ω    68X=49.9 Ω

11-1.Remark: 0603 3digit marking

**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>

11-2 Remark: 0603 3digit marking for E24

Example: 101=100Ω    102=1KΩ

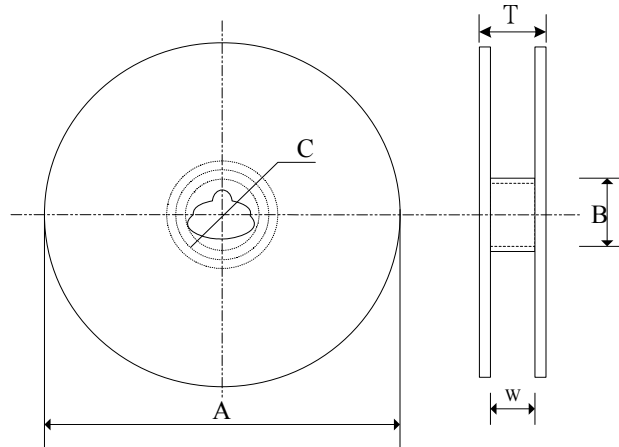
E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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11-3 Remark: 0805~2512 4digit marking for Example:

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

## 12. Packaging

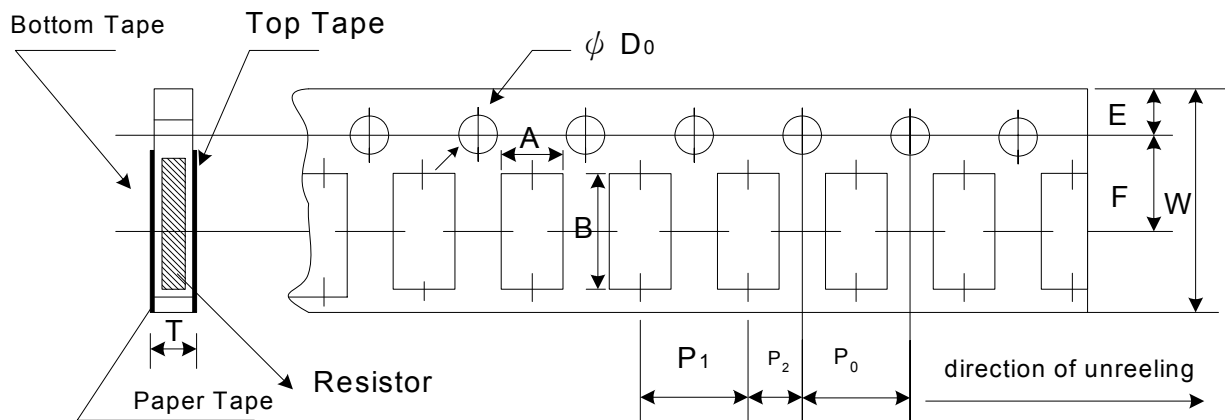
### 12-1-1 Reel Specifications & Package Quantity



Unit :mm

Codes	$\phi A$	$\phi B$	$\phi C$	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
AR01	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
AR02	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
AR03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
AR05	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
AR06	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
AR10	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
AR12	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
AR13	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-

## 12-1-2 Paper Tape Specifications



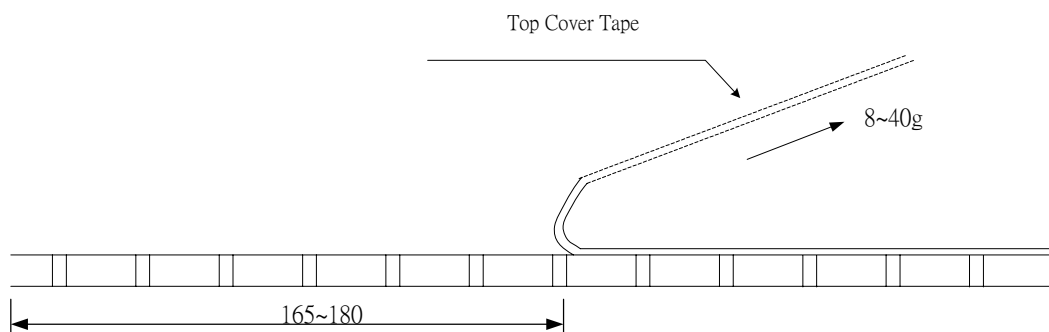
Unit: mm

Codes	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	$\phi D_0$	T
AR01	0.40±0.05	0.70±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.265±0.05
AR02	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
AR03	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
AR05	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
AR06	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±0.05	1.55±0.05	0.75±0.05
AR13	2.75±0.05	3.40±0.05	8.0±0.10	1.75±0.05	3.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.60±0.10	0.75±0.05

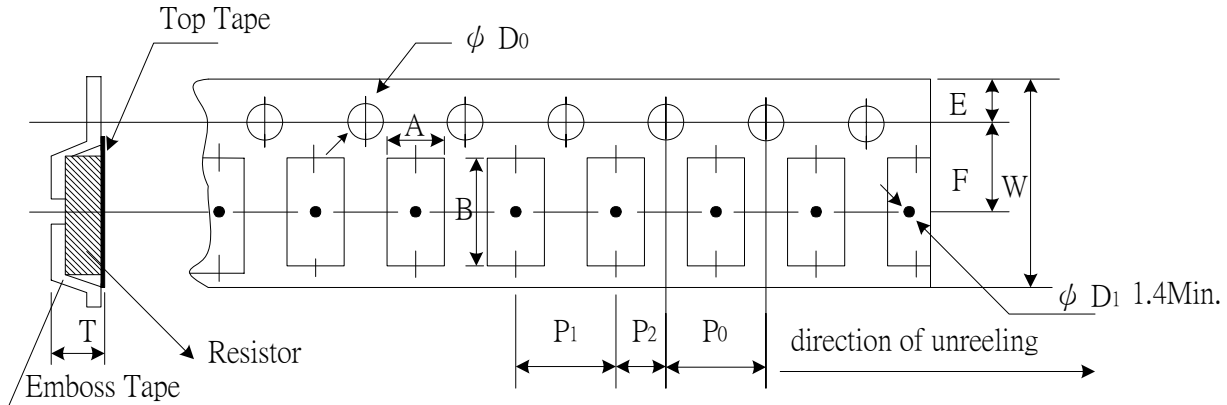
Peel force of top cover tape

The peel speed shall be about 300mm/min±5%

The peel force of top cover tape shall be between 8to 40g



## 12-1-3 Emboss Plastic Tape Specifications



Unit: mm

Codes	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	$\phi D_0$	T
AR10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
AR12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

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 20to80g

