THIN FILM PRECISION RESISTORS

TYPE RN73 SERIES

INTRODUCTION

The RN73 series is a high stability precision chip resistor range offering various power dissipations relating to chip size, TCR's down to 5ppm/°C and resistance tolerances to 0.01%. The resistor is produced with three sputtered layers giving optimum performance. Values are restricted to the E96 and E24 value grids. The RN73 has accurate and uniform physical dimensions to facilitate placement.

FEATURES

- High precision - TCR 5ppm/°C and 10ppm/°C
- Tolerance down to 0.01%
- Thin film (nichrome)
- Terminal finish – electroplated 100% matte Sn
- Moisture Sensitive Level - MSL1

Note: *SMD (Surface mount devices) resistors and inductors should be kept in their original packaging to protect them from ESD (Electrostatic Discharge). The full reels can be broken into smaller quantities, without exposing them to ESD, as long as the components are still in the plastic or paper tape. These resistors and inductors should not be removed from the plastic or paper tape unless they are in an ESD protected environment.*

APPLICATIONS

- Communications
- Industrial controls
- Instrumentation
- Medical

Characteristics – Electrical

0402											
Rated power @ 70°C		0.063W									
Resistance range Ω	Minimum	49R9		49R9		49R9		49R9		49R9	
	Maximum	20K		20K		20K		20K		100K	
Tolerance (%)		0.01				0.05				0.1	
Code letter		L				A				B	
T.C.R. (PPM°C)		5		10		5		10		5	10
Code letter		A		C		A		C		A	C
Selection series		E24 & E96									
Maximum operating voltage		50V									
Maximum overload voltage		100V									
Operating temp. range		-55 ~ +155°C									
Insulation resistance (dry minimum)		1000MΩ									
Stability		0.5%									

Thin Film Precision Resistors

Type RN73 Series

0603												
Rated power @ 70°C		0.063W										
Resistance range Ω	Minimum	24R9		24R9		24R9		4R7		24R9		4R7
	Maximum	60K		100K		60K		332K		60K		511K
Tolerance (%)		0.01				0.05				0.1		
Code letter		L				A				B		
T.C.R. (PPM°C)		5		10		5		10		5		10
Code letter		A		C		A		C		A		C
Selection series		E24 & E96										
Maximum operating voltage		50V										
Manimum overload voltage		100V										
Operating temp. range		-55 ~ +155°C										
Insulation resistance (dry minimum)		1000MΩ										
Stability		0.5%										

0805												
Rated power @ 70°C		0.1W										
Resistance range Ω	Minimum	24R9		24R9		4R7		24R9		4R7		4R7
	Maximum	150K		200K		150K		1M0		150K		1M0
Tolerance (%)		0.01				0.05				0.1		
Code letter		L				A				B		
T.C.R. (PPM°C)		5		10		5		10		5		10
Code letter		A		C		A		C		A		C
Selection series		E24 & E96										
Maximum operating voltage		100V										
Maximum overload voltage		200V										
Operating temp. range		-55 ~ +155°C										
Insulation resistance (dry minimum)		1000MΩ										
Stability		0.5%										

1206												
Rated power @ 70°C		0.125W										
Resistance range Ω	Minimum	24R9		24R9		24R9		4R7		24R9		4R7
	Maximum	300K		499K		300K		1.5M0		300K		1.5M0
Tolerance (%)		0.01				0.05				0.1		
Code letter		L				A				B		
T.C.R. (PPM°C)		5		10		5		10		5		10
Code letter		A		C		A		C		A		C
Selection series		E24 & E96										
Max operating voltage		150V										
Maximum overload voltage		300V										
Operating temp. range		-55 ~ +155°C										
Insulation resistance (dry minimum)		1000MΩ										
Stability		0.5%										

Thin Film Precision Resistors

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1210								
Rated power @ 70°C		0.25W						
Resistance range Ω	Minimum	24R9	24R9	24R9	4R7	24R9	4R7
	Maximum	300K	499K	300K	1M0	300K	1M0
Tolerance (%)		0.01		0.05		0.1	
Code letter		L		A		B	
T.C.R. (PPM°C)		5	10	5	10	5	10
Code letter		A	C	A	C	A	C
Selection series		E24 & E96					
Max operating voltage		150V					
Maximum overload voltage		300V					
Operating temp. range		-55 ~ +155°C					
Insulation resistance (dry minimum)		1000MΩ					
Stability		0.5%					

2010								
Rated power @ 70°C		0.25W						
Resistance range Ω	Minimum	24R9	24R9	24R9	4R7	24R9	4R7
	Maximum	300K	499K	300K	1M0	300K	1M0
Tolerance (%)		0.01		0.05		0.1	
Code letter		L		A		B	
T.C.R. (PPM°C)		5	10	5	10	5	10
Code letter		A	C	A	C	A	C
Selection series		E24 & E96					
Max operating voltage		150V					
Maximum overload voltage		300V					
Operating temp. range		-55 ~ +155°C					
Insulation resistance (dry minimum)		1000MΩ					
Stability		0.5%					

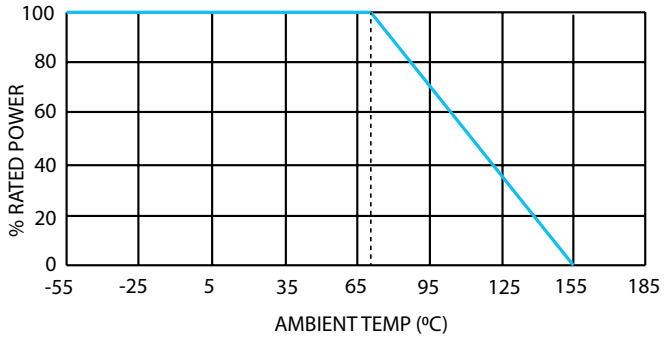
2512								
Rated power @ 70°C		0.5W						
Resistance range Ω	Minimum	24R9	24R9	24R9	4R7	24R9	4R7
	Maximum	300K	499K	300K	1M0	300K	1M0
Tolerance (%)		0.01		0.05		0.1	
Code letter		L		A		B	
T.C.R. (PPM°C)		5	10	5	10	5	10
Code letter		A	C	A	C	A	C
Selection series		E24 & E96					
Max operating voltage		150V					
Maximum overload voltage		300V					
Operating temp. range		-55 ~ +155°C					
Insulation resistance (dry minimum)		1000MΩ					
Stability		0.5%					

Environmental Characteristics

Item	Requirement		Test Method
	Tol. ≤0.05%	TOL. >0.05%	
Temperature coefficient of resistance (TCR)	As per TCRs specified in electrical characteristics tables		**MIL-STD-202 Method 304** +25/-55/+25/+125/+25°C
Short time overload	ΔR±0.05%	ΔR±0.2%	**JIS-C-5201-1 4.13** RCWV*2.5 or Maximum overload voltage whichever is lower for 5 seconds
Insulation resistance	>9999 MΩ		**MIL-STD-202 Method 302** Apply 100VDC for 1 minute
Endurance	ΔR±0.05%	ΔR±0.2%	**MIL-STD-202 Method 108A** 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp heat with load	`ΔR±0.05%	ΔR±0.3%	**MIL-STD-202 Method 103B** 40±2°C, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending strength	ΔR±0.05%	ΔR±0.1%	**JIS-C-5201-1 4.33** Bending amplitude 3 mm for 10 seconds
Solderability	95% minimum coverage		**MIL-STD-202 Method 208H** 245±5°C for 3 seconds
Resistance to soldering heat	ΔR±0.05%	ΔR±0.1%	**MIL-STD-202 Method 210E** 260±5°C for 10 seconds
Dielectric withstand voltage	By Type		**MIL-STD-202 Method 301** Maximum overload voltage for 1 minute
Low temperature operation	ΔR±0.05%	ΔR±0.2%	**JIS-C-5201-1 4.36** 1 hour, -65°C, followed by 45 minutes of RCWV
High temperature exposure	ΔR±0.5%		**MIL-STD-202 Method 108** At +155°C for 1000 hours

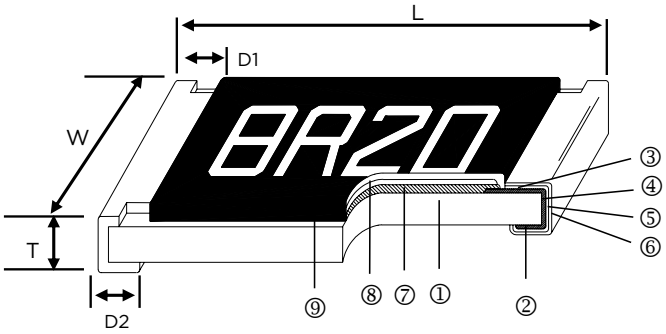
RCWV(Rated continuous working voltage)= √(P*R) or Maximum Operating voltage whichever is lower
Storage temperature: 25±3°C; Humidity < 80%RH
Moisture sensitivity level: Level 1

Derating Curve



For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with this curve.

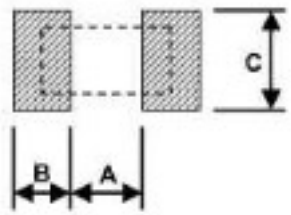
Construction and dimensions



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (NiCr)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Ni)	⑧	Overcoat (Epoxy)
③	Top Electrode (Ag)	⑥	External Electrode (Sn)	⑨	Marking

Size	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000 Pcs.)
0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.54
0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.83
0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.20	4.71
1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	9.02
1210	3.10±0.15	2.40±0.15	0.55±0.10	0.40±0.20	0.55±0.25	10
2010	4.90±0.15	2.40±0.15	0.55±0.10	0.60±0.30	0.50±0.25	23.61
2512	6.30±0.15	3.10±0.15	0.55±0.10	0.60±0.30	0.50±0.25	38.06

Recommended Land Pattern



Size	A	B	C
0402	0.50	0.50	0.60±0.2
0603	0.80	1.00	0.90±0.2
0805	1.00	1.00	1.35±0.2
1206	2.00	1.15	1.70±0.2
1210	2.00	1.15	2.50±0.2
2010	3.60	1.40	2.50±0.2
2512	4.90	1.60	3.10±0.2

Marking

Case sizes 0805 to 2512 IEC 4 Digit Marking:

Resistance	100R (100Ω)	2K2 (2.2kΩ)	10K (10kΩ)	49.9K (49.9kΩ)	100K (100kΩ)
Code	1000	2201	1002	4992	1003

Case Size 0603 E24 3 digit marking – Example 101 = 100R 102=1K0

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

Case size 0603 E96 3 digit marking – Examples 14C = 13K7 68B = 4K99 68X = 49R9

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

Case Size 0603 E24 3 digit marking – Example 101 = 100R 102=1K0

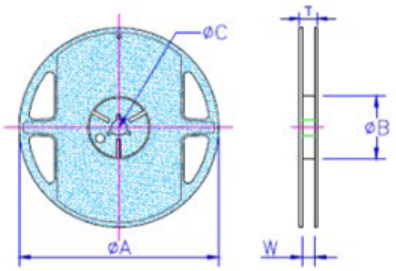
Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^{-1}	10^{-2}	10^{-3}

NB For case size 0603 values other than E24 and E96 resistors will be supplied unmarked.

All resistors smaller than 0603 supplied unmarked.

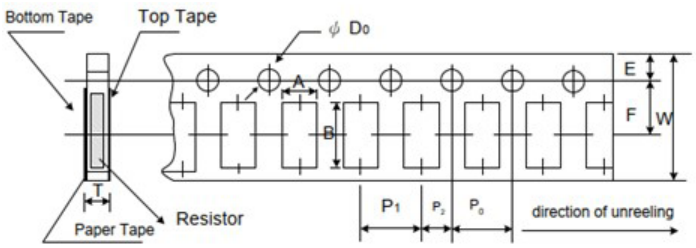
Packaging

Packing Quantity and Reel Specification



Size	ØA ±1.0	ØB ±1.0	ØC ±0.7	W ±1.0	T ±1.0	Paper Tape	Embossed Plastic Tape
0402	178.0	60.0	13.5	9.5	11.5	1000 / 5000	N/A
0603							
0805							
1206							
1210							
2010				13.5	15.5	N/A	4000
2512							

Paper tape Specification

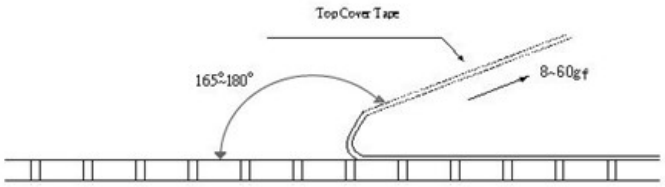


Size	A ±0.05	B ±0.05	W ±0.10	E ±0.05	F ±0.05	P_0	P_1	P_2 ±0.05	$ØD_0$	T
0402	0.70	1.16	8.00	1.75	3.5	4.00 ±0.10	2.00 ±0.05	2.00	1.55 ±0.05	0.40 ±0.03
0603	1.10	1.90					4.00 ±0.10			0.60 ±0.03
0805	1.60	2.37								0.75 ±0.05
1206	2.00	3.55								
1210	2.75	3.40				4.00 ±0.05			1.60 ±0.10	

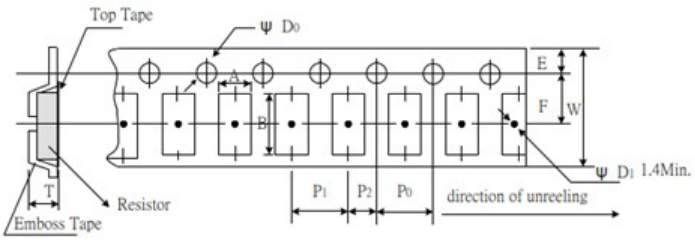
Peel force of top cover tape

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

The peel force of top cover tape shall be between 8gf to 60gf



Embossed Plastic Tape Specifications

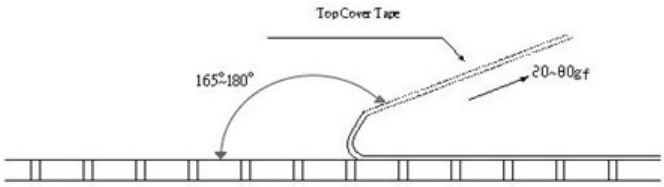


Type	A	B	W	E	F	P0	P1	P2	ØD0	T
2010	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
2512	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

Peel force of top cover tape

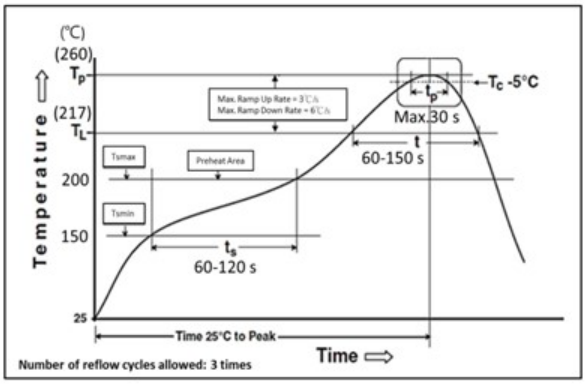
The peel speed shall be about 300mm/min±5%

The peel force of top cover tape shall be between 20gf to 80gf



Soldering Condition

Reflow Soldering (Ref. IPC/JEDEC J-STD-020 & J-SD-002)



Reflow Profiles	
Profile Feature	**Pb-Free Assembly**
Preheat	
Minimum Temperature (Tsmin)	150°C
Maximum Temperature (Tsmax)	200°C
Preheating time (ts) from (Tsmin to Tsmax)	60-120 seconds
Ramp-up rate (TL to Tp)	3°C/second maximum
Liquidous temperature (TL)	217°C
Time (TL) maintained above TL	60-150 seconds
Minimum Peak temperature (Tp min)	235°C
Maximum Peak temperature (Tp max)	260°C
Time (tp) within 5°C of the specified classification temperature (Tc)	30 seconds maximum
Ramp-down rate (Tp to TL)	6°C/seconds maximum
Time 25°C to peak temperature	8 minutes maximum

ORDERING INFORMATION

Part Number
RN73 C 2A 100R B TD

Common Part

RN73	High precision thin film chip resistor

TCR

A	±5ppm/°C
***C**	±10ppm/°C

* preferred stock item

Package Size

1E	0402
1J	0603
2A	0805
2B	1206
2E	1210
2H	2010
3A	2512

Packaging

TG	250 cut tape length (1E, 1J, 2A, 2B)
TDF	TDF – 1000 reel (1E, 1J, 2A, 2B)
TD	5000 reel (1E, 1J, 2A, 2B, 2E)
TE	4000 reel (2H, 3A only)

Tolerance

L	±0.01%
A	±0.05%
B	±0.1%

Value

100R	100Ω
1K0	1000Ω
10K	10,000Ω
100K	100,000 Ω

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