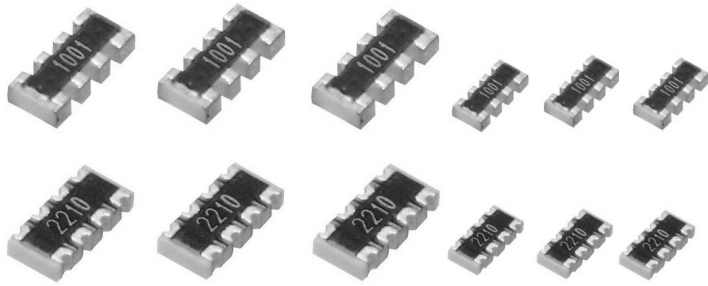




ELECTRO-MECHANICS

# Thick Film Chip Resistors.

## Rectangular type – Array Precision



### ■ FEATURES

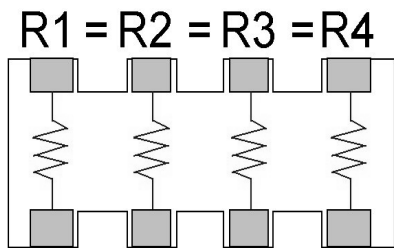
- High precision.
- Reducing SMD surface area (40% reduced).
- Reducing SMD costs (75% reduced).
- Both flow and reflow soldering are applicable.
- Convex & concave type.

### ■ APPLICATION

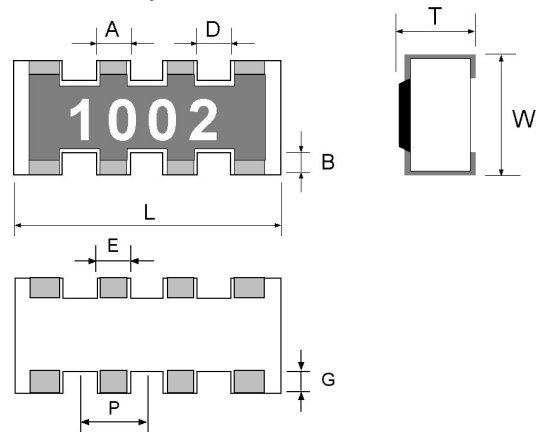
- For semiconductor devices.
- For computers, digital circuits.

### ■ STRUCTURE AND DIMENSIONS (CONVEX TYPE ; R/P DIPPING TYPE)

• Structure



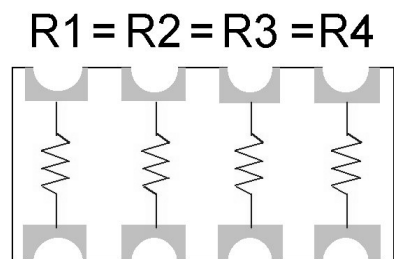
• Dimensions



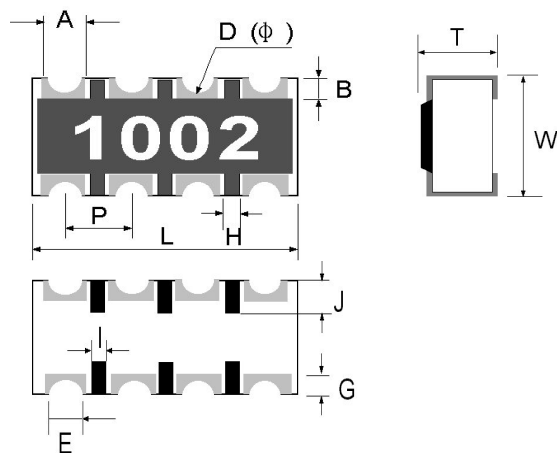
TYPE	L	W	T	A	D	B	P	E	G	Unit Weight
104P	2.00±0.20	1.00±0.20	0.35±0.10	0.30±0.15	0.15 Max.	0.15±0.10	0.50±0.15	0.25±0.15	0.25±0.15	2.6mg
164P	3.20±0.20	1.50±0.20	0.60±0.20	0.40±0.20	0.35 Max.	0.30±0.20	0.80±0.15	0.40±0.20	0.30±0.20	8.5mg

### ■ STRUCTURE AND DIMENSIONS (CONCAVE TYPE ; R/N THROUGH HOLE TYPE)

• Structure



• Dimensions



(UNIT : mm)

TYPE	L	W	T	A	B	D(Φ)	E	G	H	I	J	P	Unit Weight
104P	2.00±0.10	1.00±0.15	0.40±0.10	0.30±0.10	0.20±0.10	0.14±0.10	0.30±0.10	0.25±0.15	0.20±0.10	0.10±0.10	-	0.50±0.10	2.9mg
164P	3.20±0.20	1.60±0.20	0.60±0.10	0.45±0.10	0.30±0.20	0.30±0.10	0.45±0.10	0.40±0.15	0.20±0.10	0.20±0.10	0.60±0.20	0.80±0.10	9.9mg



ELECTRO-MECHANICS

# Thick Film Chip Resistors.

Rectangular type – Array Precision

## ■ PARTS NUMBERING SYSTEM

- The part number system shall be in the following format

R N	1 6	4 P	F	1 0 0	F S
Code Designation	Dimension	Resistors	Tolerance	Resistance Value	Packaging Code
RN : Concave type array RP : Convex type array	10 : 1005 16 : 1608	4P : 4 Resistors	D : ± 0.5% F : ± 1%	4 digit coding system (IEC coding system) E-96 series	CS: Tape Packaging 7" FS: Tape Packaging 13" AS: Tape Packaging 13"

The new product will be available on the market from the fourth quarter of year 2001.

## ■ SPECIFICATION

TYPE	Power Rating(W)	Working Voltage(MAX)	Overload Voltage(MAX)	TCR (ppm/°C)	Resistance Range (Ω)		Rated Ambient Temperature	Rated Working Temperature
					D(±0.5%) E-96	F(±5%) E-96		
104P	1/16	50(V)	100(V)	±100ppm	-	10Ω~1MΩ	70°C	-55°C ~ +125°C
164P					-	10Ω~1MΩ		

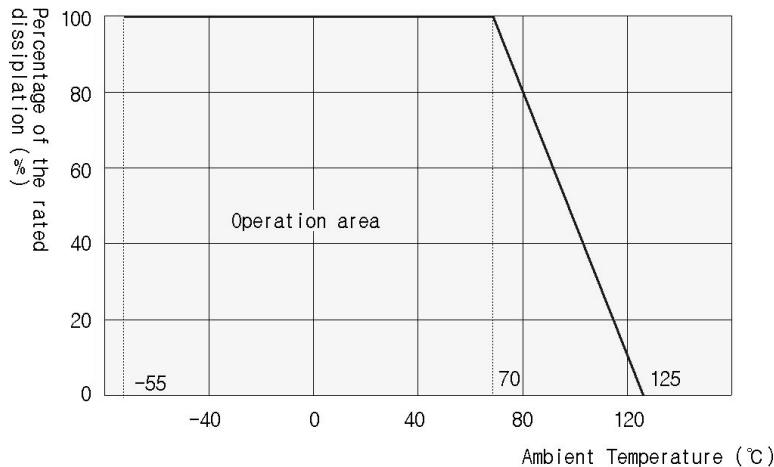
- Rated voltage (V) =  $\sqrt{\text{Rated power (W)} \times \text{Normal resistance value (R)}}$

Rated voltage should be lower than (MAX) working voltage.

## ■ POWER DERATING CURVE

The rated power is the maximum continuous loading power at 70°C ambient temperature.

For ambient temperature above 70°C, the loading power follows the below power derating curve.



## ■ MARKING

3 digits indication (E-24 series)	4 digits indication (E-96 series)
<ul style="list-style-type: none"> <li>Left 2 digits represent significant figures.</li> <li>Last 1 digit represents exponential number of 10.</li> <li>Example : 103</li> <li>Left 2 digits : 10</li> <li>Last 1 digit : 3</li> <li>103 = 10X10<sup>3</sup>Ω</li> <li>= 10000Ω = 10kΩ</li> </ul>	<ul style="list-style-type: none"> <li>Left 3 digits represent significant figures.</li> <li>Last 1 digit represents exponential number of 10.</li> <li>Example : 1002</li> <li>Left 3 digits : 100</li> <li>Last 1 digit : 2</li> <li>1002 = 100X10<sup>2</sup>Ω</li> <li>= 10000Ω = 10kΩ</li> </ul>

## ■ IEC CODE SYSTEM (E-96)

E-96	E-24	E-96	E-24	E-96	E-24	E-96	E-24
100	10	178		316		549	
102		182	18	324		562	56
105		187		332	33	575	
107		191		340		590	
110	11	196		348		604	
113		200	20	357		619	
115		205		365	36	634	62
118		210		374		649	
121	12	215		383		665	
124		221	22	392	39	681	68
127		226		402		698	
130	13	232		412		715	
133		237		422		730	75
137		243	24	432	43	748	
140		249		442		767	
143		255		453		786	
147		261		464		806	
150	15	267		475	47	825	82
154		274	27	487		845	
158		280		499		866	
162		287		511	51	887	
165	16	294		523		909	
169		301	30	536		931	91
174		309		550		953	
				566		976	

### ■ CHARACTERISTICS PERFORMANCE

• Electrical Characteristic

Item		Requirements Specification	Test Methods
Direct Current Resistance		Within the regulated resistance tolerance.	JIS C 5202 (5.1) Voltage apply within 5 sec.
Temperature Characteristic		D, F tolerance ±100ppm D tolerance ±50ppm	Test Temperature(°C) 20 → -55 → 20 → 125 → 20 T.C.R(ppm/°C)=(R-R <sub>20</sub> /R <sub>20</sub> ×1/(T/T <sub>20</sub> )×10 <sup>6</sup> × T=Test Temperature, T <sub>20</sub> =20°C R=Resistance at T, R <sub>20</sub> =Resistance at T <sub>20</sub>
Short-time Overload	ΔR	Less than ±(1%+0.1Ω)of the initial value.	Apply 2.5 times rated voltage for 5 sec. Wait 30 minutes at room temperature. Measure the resistance value.
	Visual	No evidence of mechanical damage.	
Intermittent Overload	ΔR	Less than ±(3%+0.1Ω)of the initial value.	2.5 times of rated voltage. 1 second ON, 25 second OFF. 10,000cycles.
	Visual	No evidence of mechanical damage.	
Dielectric Withstanding Voltage		No evidence of mechanical damage.	Apply voltage for 1 minute. Voltage : 100V
Insulation Resistance		Over 1,000MΩ	

The new product will be available on the market from the second quarter of year 2002.

• Mechanical Characteristic

Item		Requirements Specification	Test Methods
Solderability		Coverage : ≥95% each termination.	Rosin Flux : Rosin 25%, Methanol 75% Solder Temp. : 235± 5°C Dipping time : 2± 0.5sec.
Bending Test	ΔR	Less than ±(0.5%+0.05Ω)of the initial value.	After soldering resistor on the PCB, 3mm of bending shall be applied for 10 sec. 
	Visual	No evidence of mechanical damage.	
Terminal Strength		Voltage : Over 0.3kg	Pull direction fixed 0.4 lead. 
Resis. to Soldering H.	ΔR	Less than ±(1%+0.05Ω)of the initial value.	Immerse in molten solder at 260°C for 10±1sec. Preheat and soldering Procedure.
	Visual	No evidence of mechanical damage.	
Anti-Vibration Test	ΔR	Less than ±(1%+0.1Ω)of the initial value.	2 hours each in X,Y, and Z axis(total 6 hours) 10 to 55 Hz sweep in 1 minute at 1.5mm amplitude.
	Visual	No evidence of mechanical damage.	

• Environmental Characteristic

Item		Requirements Specification	Test Methods
Temperature Cycle	ΔR	Less than ±(1%+0.1Ω)of the initial value.	Test Temperature(°C) : -55 → 20 → 125 → 20 Test Time (minute) : 30 → 15 → 30 → 15
	Visual	No evidence of mechanical damage.	
Load Life	ΔR	Less than ±(3%+0.1Ω)of the initial value.	Test Voltage : rated voltage Temp : 70 ± 3°C Time : 1,000 <sup>+48</sup> hours (90min ; ON, 30min ; OFF)
	Visual	No evidence of mechanical damage.	
Low Temp. Exposure	ΔR	Less than ±(3%+0.1Ω)of the initial value.	Dwell in -55°C chamber without loading for 1,000 <sup>+48</sup> hours. Stabilize for 60 minute at room temperature. Measure value.
	Visual	No evidence of mechanical damage.	
High Temp. Exposure	ΔR	Less than ±(3%+0.1Ω)of the initial value.	Dwell in 125°C chamber without loading for 1,000 <sup>+48</sup> hours. Stabilize for 60 minute at room temperature. Measure value.
	Visual	No evidence of mechanical damage.	
Moisture Resistance	ΔR	Less than ±(3%+0.1Ω)of the initial value.	Test voltage : rated voltage Test Temp. : 40±2°C Time : 1,000 <sup>+48</sup> hours (90min:ON,30min:OFF) Humidity : 90~95% RH Stabilize for 1hrs & Measure.
	Visual	No evidence of mechanical damage.	