

# High Power Thick Film Chip Resistors



## FEATURES

- EIA STANDARD SIZING 0402 (1/8W), 0603 (1/8W), 0805 (1/4W), 1206 (1/2W), 1210 (1/2W), 2010 (1W) AND 2512 (2W)
- VOLTAGE RATINGS (50VDC ~ 300VDC)
- RESISTANCE VALUES (0W TO 1MW)
- THICK FILM ON ALUMINA SUBSTRATE, RuO<sub>2</sub>/Ag RESISTIVE LAYER
- GLASS AND EPOXY OVERCOAT

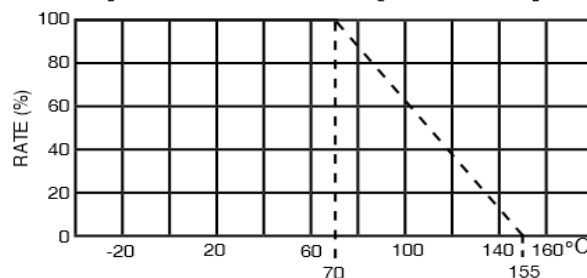
Type	EIA Size	Power Rating at 70°C	Max.*1 Working Voltage	Max.*2 Overload Voltage	Resistance Tolerance (Code)	Temperature Coefficient (ppm/°C) +20°C ~ +155°C	Resistance Range (Ω)	Resistance Value	Operating Temperature Range (°C)
ERHW04	0402	1/8W (0.125W)	50V	100V	±1% (F) ±5% (J)	-200/+400 ±100 ±200	1.0 ~ 10 >10 ~ <1M 1M	E-24,E-96	-55 ~ +155
ERHW06	0603	1/8W (0.125W)	50V	100V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	
ERHW08	0805	1/4W (0.25W)	150V	300V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	
ERHW16	1206	1/2W (0.50W)	200V	400V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	
ERHW12	1210	1/2W (0.50W)	200V	400V	±1% (F) ±5% (J)	±200 ±100	1.0 ~ <10 10 ~ 1M	E-24,E-96	
ERHW20	2010	1W	200V	400V	±1% (F) ±5% (J)	±100	1.0 ~ 1M 1.0 ~ 1M	E-24,E-96	
ERHW25	2512	2W	300V	500V	±1% (F) ±5% (J)	±100	1.0 ~ 1M	E-24,E-96	

Note \*1 - Maximum allowable continuous Working Voltage for all resistors is the lower of the two values: "Maximum Working Voltage" as specified above (or)

$$\sqrt{\text{Power rating (Watts)} \times \text{Resistance (Ohms)}}$$

Note \*2 - Maximum allowable Overload voltage is two times the Maximum Working Voltage (see Note \*1 above).

**Power Derating Curve:** For operation above 70°C, power rating must be derated according to the following chart:



## PART NUMBER SYSTEM

ERHW	06	F	100K	V	05	F
ERHW	02=0201 04=0402 06=0603 08=0805 16=1206 12=1210 20=2010 25=2512	F=±1% G=±2% J=±5%	R056=56mΩ R010=10mΩ 10K0=10KΩ 100K=100KΩ	N=1/20W Y=1/16W X=1/10W W=1/8W M=1/6W V=1/4W ----- S=2W	15=15K 10=10K 05=5K 04=4K 03=3K 01=1K	F=ROHS -----

(1): ERHW Series

(2): Size Code: 02=0201, 04=0402, 06=0603, 08=0805, 16=1206, 12=1210, 20=2010, 25=2512

(3): Tolerance Code: J = ± 5%, F = ± 1%

(4): Resistance Code: First 3 digits are significant figures (both E-24 and E-96 values), 4th digit is the multiplier, "R" indicates a decimal point.

(5): Power Rating: N=1/20; W; Y=1/16W; X=1/10W; W=1/8W; M=1/6W; P=1/5W; V=1/4W; O=1/3W; U=1/2W; Q=3/4W; T=1W; A=1.5W; S=2W; R=3W

(6): Optional 1,000 piece reel quantity: 10=10K; 05=5K; 04=4K

(7): RoHS compliant

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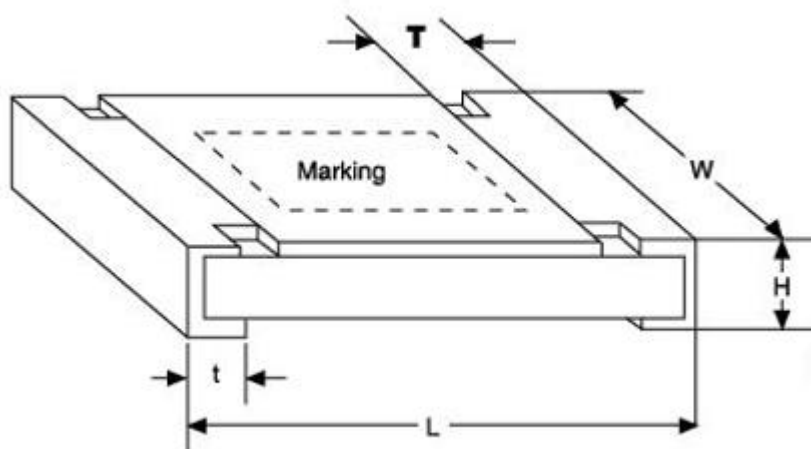


## ENVIRONMENTAL CHARACTERISTICS

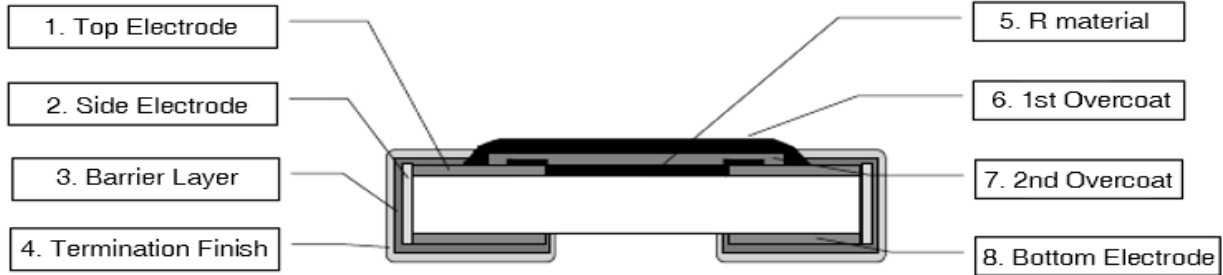
Item	Specification			Test Method
	Tol. 1%	Tol. 5%	0Ω	
Short Time Overload	$\Delta R \pm(1\% + 0.05W)$	$\Delta R \pm(2\% + 0.05W)$	20mWmax. (0402 30mWmax.)	JIS-C-5201-1 4.13 5x rated power or max overloading voltage whichever is less for 5 Seconds
Insulation Resistance	>10,000MΩ			JIS-C-5201-1 4.6 Maximum overload voltage for 1 minute
Endurance (Load Life)	$\Delta R \pm(1\% + 0.05W)$	$\Delta R \pm(3\% + 0.1W)$	20mWmax. (0402 30mWmax.)	JIS-C-5201-1 4.25 RCWV +70°C, 1.5 hours "ON", 0.5 hours "OFF" Total time 1,000 hours
Damp Heat with Load	$\Delta R \pm(1\% + 0.05W)$	$\Delta R \pm(3\% + 0.1W)$	20mWmax. (0402 30mWmax.)	JIS-C-5201-1 4.24 RCWV +40°C, 90~95% RH, 1.5 hour "ON", 0.5 hours "OFF" Total time 1,000 hours
Bending Strength	$\Delta R \pm(0.5\% + 0.05W)$	$\Delta R \pm(1\% + 0.1W)$	20mWmax. (0402 30mWmax.)	JIS-C-5201-1 4.33 Bend once for 10 seconds (0603 ~ 1206: 3mm, 2010, 2512: 2mm)
Solderability	>95% minimum coverage			JIS-C-5201-1 4.17 235°C ± 5°C for 2 ± 0.5 seconds
Resistance to Soldering Heat	$\Delta R \pm(0.5\% + 0.05W)$	$\Delta R \pm(1\% + 0.1W)$	20mWmax. (0402 30mWmax.)	JIS-C-5201-1 4.18 260°C ± 5°C for 10 seconds
Withstanding Voltage	No breakdown or flashover		20mWmax. (0402 30mWmax.)	JIS-C-5201-1 4.7 maximum overload voltage (AC) for 1 minute
Temperature Cycling	$\Delta R \pm(0.5\% + 0.05W)$	$\Delta R \pm(1\% + 0.1W)$	20mWmax. (0402 30mWmax.)	JIS-C-5201-1 4.19 30 minutes -55°C, 2 ~ 3 minutes +20°C, 30 minutes @155°C, 2 ~ 3 minutes +20°C (5 cycles)

## COMPONENT DIMENSIONS (mm)\*

Type	EIA Size	L	W	H	T	t
ERHW04	0402	1.00 ± 0.05	0.50 ± 0.05	0.35 ± 0.05	0.20 ± 0.10	0.25 ± 0.10
ERHW06	0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.15	0.30 ± 0.15	0.30 ± 0.10
ERHW08	0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.40 ± 0.20	0.40 ± 0.20
ERHW16	1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.25
ERHW12	1210	3.10 ± 0.10	2.60 ± 0.10	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20
ERHW20	2010	5.00 ± 0.20	2.50 ± 0.20	0.60 ± 0.10	0.60 ± 0.25	0.60 ± 0.25
ERHW25	2512	6.30 ± 0.20	3.10 ± 0.20	0.60 ± 0.15	0.60 ± 0.25	1.80 ± 0.25



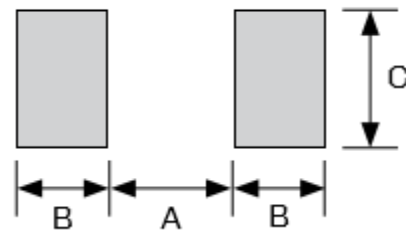
## CONSTRUCTION



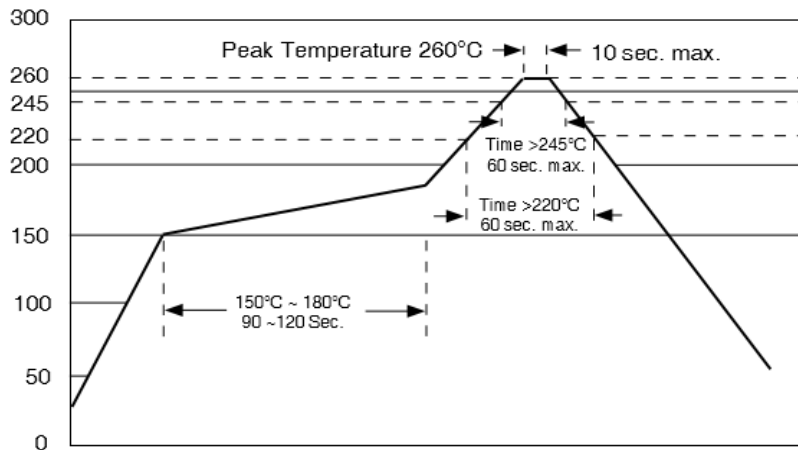
- 1. Ag/Pd Top Electrode
- 2. NiCr Side Electrode
- 3. Ni Barrier
- 4. 100% Sn Finish
- 5. Thick Film RuO<sub>2</sub>
- 6. Epoxy Resin
- 7. Glass
- 8. Ag Bottom Electrode

## LAND PATTERN DIMENSIONS (mm)

Type	EIA Size	A	B	C
ERHW04	0402	0.50	0.50	0.60
ERHW06	0603	0.90	0.60	0.90
ERHW08	0805	1.20	0.70	1.30
ERHW16	1206	2.00	0.90	1.60
ERHW12	1210	2.00	0.90	2.80
ERHW20	2010	3.80	0.90	2.80
ERHW25	2512	3.80	1.60	3.50



## REFLOW SOLDERING TEMPERATURE PROFILE



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## COMPONENT MARKING (Note: no marking on 0402 case size parts).

1. For **E-24** Series J ( $\pm 5\%$ ) Tolerance In 0603, 0805, 1206, 2010 and 2512 sizes: 3 DIGIT SYSTEM - First two digits are significant and third digit is multiplier

Examples: 100 = 10 ohms 101 = 100 ohms 102 = 1,000 ohms 103 = 10,000 ohms 104 = 100,000 ohms 105 = 1,000,000 ohms

2. For **E-96** Series F ( $\pm 1\%$ ) Tolerance in 0805, 1206 and 2010 and 2512 sizes: 4 DIGIT SYSTEM - First 3 digits are significant and fourth digit is multiplier, "R" represents decimal point

Examples: 10R0 = 10 ohms 1000 = 100 ohms 1001 = 1,000 ohms 1002 = 10,000 1003 = 100,000 ohms

3. For **E-96** Series F ( $\pm 1\%$ ) Tolerance in 0603 size (available from 1.0 ohm ~ 1.0Mohm)

Special 3 DIGIT SYSTEM below (Due to space restrictions)

### 0603 E-96 VALUES 1% TOLERANCE RESISTANCE CODE

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

## REEL SPECIFICATIONS

Type	Reel Diameter		$\phi$ B (mm)	C (mm)	W (mm)	Reel Qty
	$\phi$ A					
ERHW04	7"	$\phi 178 \pm 2.0$	$\phi 60 \pm 1.0$	13.0 $\pm$ 0.2	9.0 $\pm$ 0.5	10000
ERHW06	10"	$\phi 254 \pm 2.0$	$\phi 100 \pm 1.0$			20000
ERHW08	13"	$\phi 330 \pm 2.0$				70000
ERHW16	7"	$\phi 178 \pm 2.0$	$\phi 60 \pm 1.0$			5000
ERHW12	10"	$\phi 254 \pm 2.0$	$\phi 100 \pm 1.0$		5000	
ERHW20	13"	$\phi 330 \pm 2.0$			4000	
ERHW25	7"	$\phi 178 \pm 2.0$	$\phi 60 \pm 1.0$	12.4 $\pm$ 1.0	4000	

