



## Thick Film Surface Mount Chip Resistors, Wraparound, Extremely Low Value (0.01 Ω to 0.976 Ω)



### LINKS TO ADDITIONAL RESOURCES



### FEATURES

- Extremely low resistance values (0.01 Ω to 0.976 Ω)
- Sulfur resistant (per ASTM B809-95 humid vapor test)
- Enhanced power rating due to long side terminal construction (0612, 1020 types)
- Suitable for current sensing and shunts
- Metal glaze on high quality ceramic
- Protective overglaze
- Lead (Pb)-free solder contacts on Ni barrier layer
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

STANDARD ELECTRICAL SPECIFICATIONS						
GLOBAL MODEL	CASE SIZE	POWER RATING $P_{70\text{ }^\circ\text{C}}$ W	TEMPERATURE COEFFICIENT + ppm/°C	RESISTANCE RANGE Ω	TOLERANCE ± %	E-SERIES <sup>(2)</sup>
RCWE0402 <sup>(3)(4)</sup>	0402	0.125	400	0.033 to 0.05	5.0	24
			200	0.051 to 0.196	1.0, 5.0	24; 96
			100	0.2 to 0.976	0.5 <sup>(1)</sup> , 1.0, 5.0	
RCWE0603 <sup>(4)</sup>	0603	0.2	700	0.010 to 0.018	5.0	24
			400	0.02 to 0.0324	1.0, 5.0	24; 96
			200	0.033 to 0.105	1.0, 5.0	
RCWE0805 <sup>(4)</sup>	0805	0.25	100	0.11 to 0.976	0.5 <sup>(1)</sup> , 1.0, 5.0	24; 96
			400	0.010 to 0.018	5.0	
			300	0.02 to 0.0324	1.0, 5.0	
RCWE0612 <sup>(4)</sup>	0612	1.0	400	0.051 to 0.976	0.5 <sup>(1)</sup> , 1.0, 5.0	24; 96
			300	0.010 to 0.016	2.0, 5.0	
			200	0.018 to 0.2	2.0, 5.0	
RCWE1206 <sup>(4)</sup>	1206	0.5	100	0.205 to 0.976	1.0, 5.0	24; 96
			600	0.010 to 0.018	5.0	
			300	0.02 to 0.0324	1.0, 5.0	
RCWE1210 <sup>(4)</sup>	1210	1.0	200	0.033 to 0.05	1.0, 5.0	24; 96
			100	0.051 to 0.976	0.5 <sup>(1)</sup> , 1.0, 5.0	
			500	0.010 to 0.018	5.0	
RCWE1020 <sup>(4)</sup>	1020	2.0	300	0.02 to 0.0324	1.0, 5.0	24; 96
			200	0.010 to 0.016	2.0, 5.0	
			100	0.0162 to 0.976	1.0, 5.0	
RCWE2010 <sup>(4)</sup>	2010	1.0	600	0.010 to 0.018	5.0	24
			300	0.02 to 0.0324	1.0, 5.0	
			200	0.033 to 0.05	1.0, 5.0	
RCWE2512 <sup>(4)</sup>	2512	2.0	100	0.051 to 0.976	0.5 <sup>(1)</sup> , 1.0, 5.0	24; 96
			600	0.010 to 0.018	5.0	
			300	0.02 to 0.0324	1.0, 5.0	
			200	0.033 to 0.05	1.0, 5.0	
			100	0.051 to 0.976	0.5 <sup>(1)</sup> , 1.0, 5.0	

### Notes

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- Part marking: Reference "Surface Mount Resistor Marking" ([www.vishay.com/doc?20020](http://www.vishay.com/doc?20020))
- Temperature range of TCR rating is 0 °C to 150 °C. TCR values are (+) range only with no (-) range values; 1/2 of previous tolerance range
- <sup>(1)</sup> Tight tolerance of 0.5 % is available for resistance values above 0.300 Ω (0402 size) and above 0.200 Ω (0603 to 2512 sizes)
- <sup>(2)</sup> Use E24 decades only for 5.0 % tolerance. E24 or E96 decades are available for 0.5 % and 1.0 % tolerance. Refer to standard decade table ([www.vishay.com/doc?31001](http://www.vishay.com/doc?31001))
- <sup>(3)</sup> Terminal strength tested per AEC-Q200-006 with the exception of 0.75 kg force is used
- <sup>(4)</sup> Qualified to AEC-Q200 rev. D

**GLOBAL PART NUMBER INFORMATION**

 Global Part Numbering Example: RCWE060351L0FNEA (visit [www.vishay.net](http://www.vishay.net) Vishay Dale parts numbering manual for all options)

R	C	W	E	0	6	0	3	5	1	L	0	F	N	E	A		
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**GLOBAL MODEL**  
(8 digits)

 RCWE0402  
 RCWE0603  
 RCWE0805  
 RCWE0612  
 RCWE1206  
 RCWE1210  
 RCWE1020  
 RCWE2010  
 RCWE2512

**VALUE**  
(4 digits)

 L = mΩ \*  
 R = decimal  
 10L0 = 0.01 Ω  
 R470 = 0.47 Ω  
**Note:**  
 \* Use "L" for resistance values < 0.1 Ω

**TOLERANCE**  
(1 digit)

 D = ± 0.5 %  
 F = ± 1.0 %  
 G = ± 2.0 %  
 J = ± 5.0 %

**TCR**  
(1 digit)

 K = +100 ppm/°C  
 N = +200 ppm/°C  
 M = +300 ppm/°C  
 Q = +400 ppm/°C  
 P = +500 ppm/°C  
 T = +600 ppm/°C  
 G = +700 ppm/°C

**PACKAGING**  
(2 digits)

EA = lead (Pb)-free, tape/reel

**SPECIAL**  
(up to 2 digits)

(dash number) from 1 to 99 as applicable

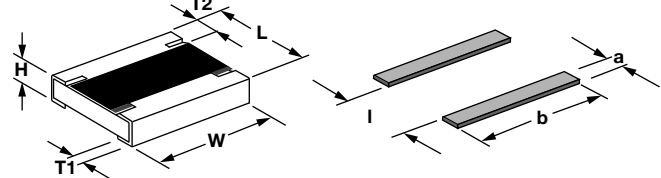
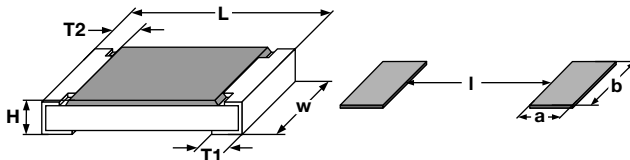
**TECHNICAL SPECIFICATIONS**

PARAMETER	UNIT	0402	0603	0805	0612	1206	1210	1020	2010	2512
Operating temperature range	°C	-55 to +155								
Maximum operating voltage	V	$(P \times R)^{1/2}$								
Insulation voltage $U_{ins}$ (1 min)	V	> 75	> 100	> 200	> 100	> 300	> 300	> 300	> 300	> 300
Insulation resistance	Ω	> 10 <sup>9</sup>								
Weight/1000 pieces (typical)	g	0.7	3	5.5	11.5	10.5	17.5	27.5	26	40.5

**DIMENSIONS**

RCWE0402 to RCWE2512

RCWE0612, RCWE1020



SIZE	DIMENSIONS in millimeters						SOLDER PAD DIMENSIONS in millimeters						
	RESISTANCE RANGE Ω	L	W	H	T1	T2	a	b	l				
0402	0.033 to 0.976	1.05 ± 0.05	0.55 ± 0.05	0.35 ± 0.1	0.3 ± 0.15	0.25 ± 0.1	0.7	0.7	0.3				
0603	0.01 to 0.03	1.6 ± 0.1	0.85 ± 0.1	0.5 ± 0.1	0.5 ± 0.2	0.3 ± 0.2	0.9	1.0	0.4				
	0.033 to 0.976				0.3 ± 0.2					0.7	0.8		
0805	0.01 to 0.03	2.0 ± 0.15	1.3 ± 0.1	0.55 ± 0.1	0.6 ± 0.2	0.35 ± 0.2	1.0	1.4	0.6				
	0.033 to 0.976				0.4 ± 0.2					0.8	1.0		
0612	0.01 to 0.976	1.6 ± 0.2	3.2 ± 0.2	0.6 ± 0.1	0.4 ± 0.15	0.25 ± 0.15	0.9	3.5	0.8				
	0.01 to 0.03									0.9 ± 0.2	1.3	1.8	1.0
	0.033 to 0.05									0.8 ± 0.2			
1206	0.051 to 0.976	3.1 ± 0.15	1.6 ± 0.15	0.6 ± 0.1	0.45 ± 0.2	0.45 ± 0.2	1.0	1.8	1.6				
	0.01 to 0.03									0.9 ± 0.2	1.2	1.8	1.2
	0.033 to 0.05									0.8 ± 0.2			
1210	0.01 to 0.03	3.1 ± 0.2	2.5 ± 0.2	0.6 ± 0.1	0.8 ± 0.2	0.4 ± 0.2	1.3	2.6	1.1				
	0.033 to 0.976				0.4 ± 0.2					0.9	2.0		
1020	0.01 to 0.976	2.5 ± 0.2	5.0 ± 0.2	0.6 ± 0.1	0.55 ± 0.15	0.30 ± 0.15	1.2	5.5	1.4				
2010	0.01 to 0.03	5.0 ± 0.2	2.5 ± 0.15	0.6 ± 0.1	1.6 ± 0.3	0.6 ± 0.2	2.3	3.0	1.4				
	0.033 to 0.05				0.7 ± 0.3					1.4	3.0	3.2	
	0.051 to 0.976				0.7 ± 0.3					1.4	3.0	3.2	
2512	0.01 to 0.03	6.3 ± 0.2	3.15 ± 0.15	0.6 ± 0.1	2.0 ± 0.3	0.6 ± 0.2	2.8	3.6	1.4				
	0.033 to 0.05				0.8 ± 0.3					1.6	3.6	3.8	
	0.051 to 0.976				0.8 ± 0.3					1.6	3.6	3.8	

**Notes**

- 3D models available: [www.vishay.com/doc?31106](http://www.vishay.com/doc?31106)
- Surface mount solder profile recommendations: [www.vishay.com/doc?31052](http://www.vishay.com/doc?31052)

**DERATING**



**SINGLE PULSE**



**SINGLE PULSE**





PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal shock	MIL-STD-202, method 107, -55 °C to +125 °C, 300 cycles at each extreme	± 1.0 % + 0.0005 Ω
Short time overload	2 x rated power; size and duration - 0402: 0.5 s, 0603 and 0805: 1 s, 1206 and larger: 2 s	± 0.5 % + 0.0005 Ω
High temperature exposure	MIL-STD-202, method 108, 1000 h at T = 125 °C, 0 % power	± 2.0 % + 0.0005 Ω
Temperature cycling	JESD 22, method JA-104, 1000 cycles (-55 °C to +125 °C)	± 2.0 % + 0.0005 Ω
Biased humidity	MIL-STD-202, method 103, 1000 h 85 °C / 85 % RH, 10 % x (P x R) <sup>1/2</sup>	± 2.0 % + 0.0005 Ω
Mechanical shock	MIL-STD-202, method 213, condition C, 10 g's, 6 ms (half sine), 3 directions	± 1.0 % + 0.0005 Ω
Vibration	MIL-STD-202, method 204, 5 g's, 20 min, 12 cycles, 3 directions, 10 Hz to 2000 Hz	± 1.0 % + 0.0005 Ω
Operational life	MIL-STD-202, method 108, 1000 h at T = 125 °C at rated power	± 2.0 % + 0.0005 Ω
Resistance to solder heat	MIL-STD-202, method 210, +260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence	± 1.0 % + 0.0005 Ω
Moisture resistance	MIL-STD-202, method 106, 0 % power, 7a and 7b not required	± 2.0 % + 0.0005 Ω

**Note**

- Contact [ww2bresistors@vishay.com](mailto:ww2bresistors@vishay.com) for application specific performance requirements or qualification data. Typical performance is better than stated test limits

PACKAGING					
MODEL	REEL				
	TAPE WIDTH	DIAMETER	PITCH	PIECES/REEL	CODE
RCWE0402	8 mm / punched paper	180 mm / 7"	2 mm	10 000	EA
RCWE0603	8 mm / punched paper	180 mm / 7"	4 mm	5000	EA
RCWE0805	8 mm / punched paper	180 mm / 7"	4 mm	5000	EA
RCWE0612	8 mm / punched paper	180 mm / 7"	4 mm	5000	EA
RCWE1206	8 mm / punched paper	180 mm / 7"	4 mm	5000	EA
RCWE1210	8 mm / punched paper	180 mm / 7"	4 mm	5000	EA
RCWE1020	12 mm / embossed plastic	180 mm / 7"	4 mm	4000	EA
RCWE2010	12 mm / embossed plastic	180 mm / 7"	4 mm	4000	EA
RCWE2512	12 mm / embossed plastic	180 mm / 7"	8 mm	2000	EA

**Notes**

- Embossed carrier tape per EIA-481-1A
- Additional packaging details at: [www.vishay.com/doc?31543](http://www.vishay.com/doc?31543)

LINKS TO RELATED DOCUMENTS	
<b>SELECTOR GUIDE</b>	
Overview of Automotive Grade Products	<a href="http://www.vishay.com/doc?49924">www.vishay.com/doc?49924</a>
<b>TECHNICAL NOTES</b>	
SMD Current Sense: AEC-Q200 vs. Vishay Qualification	<a href="http://www.vishay.com/doc?30416">www.vishay.com/doc?30416</a>
MIL-PRF vs. AEC-Q200: Do You Know What You Are Getting?	<a href="http://www.vishay.com/doc?11000">www.vishay.com/doc?11000</a>
<b>WHITE PAPER</b>	
Thermal Management for Surface-Mount Devices	<a href="http://www.vishay.com/doc?30380">www.vishay.com/doc?30380</a>
Temperature Coefficient of Resistance for Current Sensing	<a href="http://www.vishay.com/doc?30405">www.vishay.com/doc?30405</a>



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