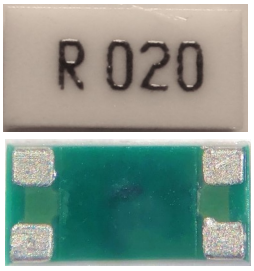
Thin Film Technology Corp.

Product Family: Current Sensing Chip Resistor (4-Terminal)

Part Number Series: WRL-L4 Series

RoHS COMPLIANT 2011/65/EU

HF HALOGEN-FREE



Construction:

- 4-terminals, separate voltage and current terminals
- High Purity Alumina Substrate
- MnCu Resistive Alloy
- Anti-sulfur / MSL 1
- 100% matte tin over Ni terminations (RoHS compliant and Pb Free)

Features:

- 1206 & 2512 English case sizes
- Power rating up to 1W
- Tolerance down to 0.3%
- Resistance down to 0.5mΩ
- TCR down to ±30ppm/°C
- High sensing accuracy
- AEC-Q200 qualified available

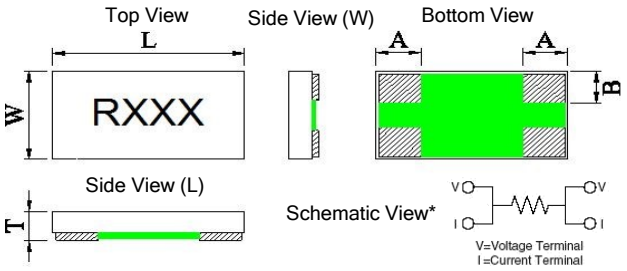
Description:

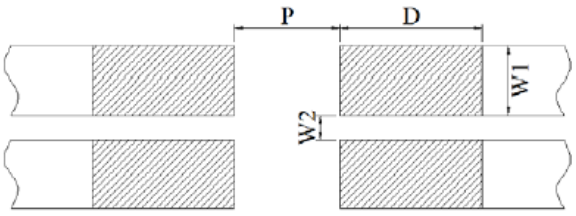
These four-terminal, low resistance chip resistors are of superior quality and provide separate voltage and current terminals for high precision and reliability, at a great price. Constructed with a bottom side element to reduce any terminal parasitics and provide better accuracy versus top side element competitors. The resistive foil element used is a proprietary alloy of nickel and copper making it impervious to environmental conditions as the element is anti-corrosive and anti-sulfur. This element exhibits ultra load life stability over time and industry leading heat dissipation making it suitable for automotive, battery pack or harsh environment use as the derating covers the -55°C to +155°C range.

Product Dimensions and Land Pattern:

Dimension (mm)	L	W	T	A	B
WRL1206	0.126 ±0.008 (3.20 ±0.20)	0.063 ±0.008 (1.60 ±0.20)	0.024 ±0.008 (0.60 ±0.20)	0.024 ±0.008 (0.60 ±0.20)	0.022 ±0.008 (0.55 ±0.20)
WRL2512	0.248 ±0.008 (6.30 ±0.20)	0.122 ±0.008 (3.10 ±0.20)	0.024 ±0.008 (0.60 ±0.20)	0.037 ±0.008 (0.95 ±0.20)	0.041 ±0.008 (1.05 ±0.20)

Dimension (mm)	P	D	W1	W2
WRL1206	0.047 (1.20)	0.071 (1.80)	0.043 (1.10)	0.012 (0.30)
WRL2512	0.122 (3.10)	0.079 (2.00)	0.055 (1.40)	0.028 (0.70)





All case sizes and dimensions are shown in inches. Metric is in parenthesis.

* Note: Rotating the schematic 180° will have no effect to the circuit.

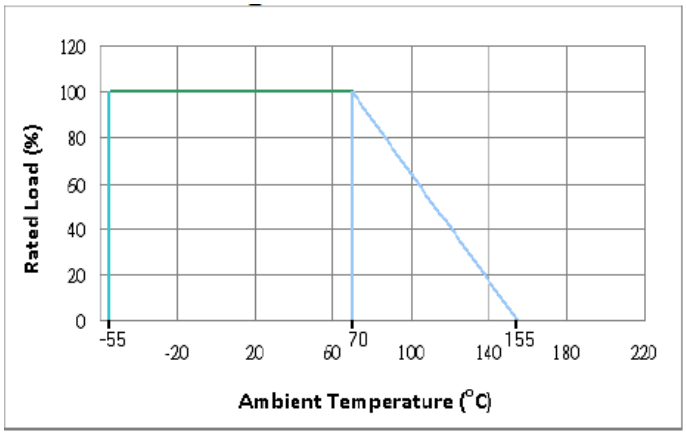
Part Numbering: Ex: WRL1206L4R010D-T5

Product Designator	English size	4 Terminal Indicator	Resistance Value	Resistance Tolerance	Automotive Grade	T&R Packaging Quantity
WRL	1206 2512	L4	Use 4 digit code for all values. "R" denotes decimal position. Ex: R005 = 5mΩ	**C** = ±0.3% **D** = ±0.5% **F** = ±1.0%	**A**= Automotive AEC-Q200 Leave Blank for Non AEC-Q200	**-T5** = 5,000 **-T4** = 4,000

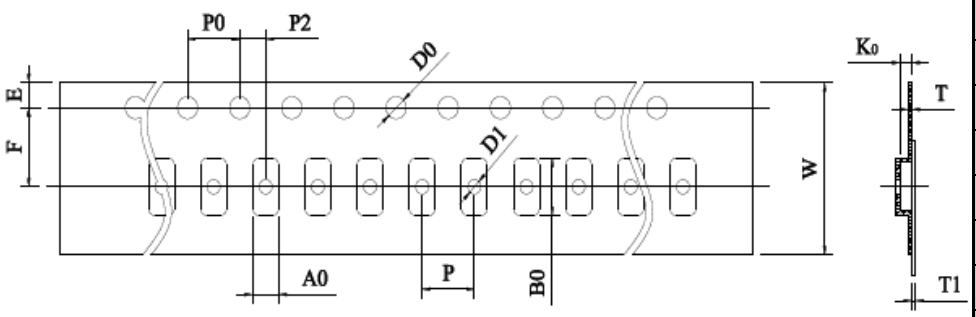
Electrical Specifications:

Type		WRL1206	WRL2512
Metric Size		3216	6432
Power (Watts)		1/2 W	1/3W (0.5mΩ), 1/2W (1~2mΩ), 1W (3~100mΩ)
Resistance Range (mΩ)		0.5Ω and 1~100mΩ (1mΩ increments)	0.5Ω and 1~100mΩ (1mΩ increments)
TCR	0.5mΩ	±100 ppm/°C	±100 ppm/C°
	1 ~ 2mΩ	±75 ppm/°C	±75 ppm/°C
	3 ~ 4mΩ	±75 ppm/°C	±50 ppm/°C
	5 ~ 9mΩ	±50 ppm/°C	±30 ppm/°C
	10 ~ 100mΩ	±30 ppm/°C	±30 ppm/°C
Tolerance % (code)	0.5mΩ	±1%(F)	±0.5%(D), ±1%(F)
	1 ~ 4mΩ	±0.5%(D), ±1%(F)	±0.5%(D), ±1%(F)
	5 ~ 9mΩ	±0.5%(D), ±1%(F)	±0.5%(D), ±1%(F)
	10 ~ 100mΩ	±0.3%(C), ±0.5%(D)	±0.5%(D), ±1%(F)
Operating Temperature		-55°C to +155°C (refer to derating curve)	-55°C to +155°C (refer to derating curve)
Packaging		5,000 pcs/reel	4,000 pcs/reel

Power Derating Curve:



Taping Dimensions:

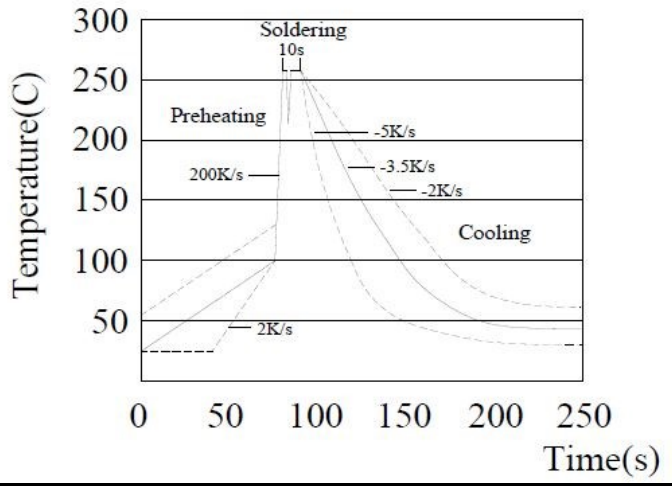


Dimension	WRL1206	WRL2512
W	8.00 ±0.03	12.0 ±0.30
P0	4.00 ±0.10	4.00 ±0.10
P	4.00 ±0.10	4.00 ±0.10
P2	2.00 ±0.10	2.00 ±0.10
A0	1.90 ±0.20	3.40 ±0.20
B0	3.50 ±0.20	6.75 ±0.20
D0	1.50 ±0.10	1.50 ±0.10
F	3.50 ±0.10	5.50 ±0.10
E	1.75 ±0.10	1.75 ±0.10
T	0.20 ±0.10	0.25 ±0.10
T1	Max 0.1	Max 0.1
K0	0.85 ±0.20	0.81 ±0.20

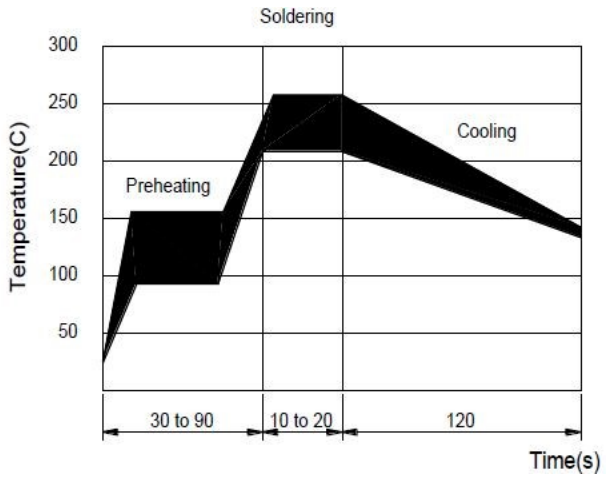
All dimensions are in mm.

Soldering Conditions:

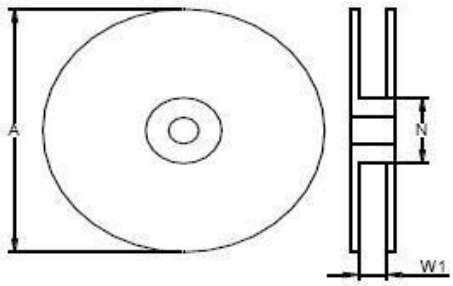
Wave Solder Temperature:



Solder Reflow Temperature Condition:



Reel Specifications:



Dimensions are in mm.

Symbol	WRL1206	WRL2512
A	178 ±5.0	178 ±5.0
N	60 ±2.0	60 ±2.0
W1	9.0 ±1.0	13.0 ±1.0

Reliability Testing:

Test	Test Method	Specification
Short Time Over Load	P= 2.5Pr ; T=25±2°C , t = 5sec.	±(1.0%+0.5mΩ) IEC60115-1 4.13
High Temp. Exposure	T = +170±2°C ; t = 1000h	±(1.0%+0.5mΩ) IEC60115-1 4.25
Low Temp. Storage	T = -55±2°C ; t = 1000h	±(1.0%+0.5mΩ) IEC60115-1 4.25
Moisture Load Life (60°C, 95%RH)	Vtest = Vmax ; T=60±2°C ; RH=95% ; t= 90min ON , 30min OFF , 1000h	±(2.0%+0.5mΩ) IEC60115-1 4.25
Thermal Shock	[-55°C 30min. → R.T. 3min. → +150°C 30min. → R.T. 3min], 100 Cycles	±(1.0%+0.5mΩ) IEC60115-1 4.19
Load Life at 70°C	Vtest = Vmax ; T=70±2°C ;t= 90min ON , 30min OFF,1000h	±(2%+0.5mΩ) IEC60115-1 4.25
Solderability	Dip into solder at T = 245±5°C , t = 3±0.5sec.	The covered area >95% IEC60115-1 4.17
Resistance to Solder Heat	Through Reflow T= 275±5°C , t =20±1sec.	±(1.0%+0.5mΩ) IEC60115-1 4.18
Mechanical Shock	a =100G , t =11ms, 5 times shock	±(1.0%+0.5mΩ) IEC60115-1 4.21
Substrate Bending	Span between fulcrums : 90mm Bend Width : 2mm ; Test board : Glass-Epoxy Board Thickness = 1.6mm	±(1.0%+0.5mΩ) IEC60115-1 4.33

AEC-Q200 Testing:

Test	Requirements	Specification
High Temp. Exposure (Storage)	Test Temperature: 125°C ± 2°C Test period: 1,000 hours No electrical load	±(1.0%+0.5mΩ) MIL-STD-202 Method 108
Temperature Cycling (Thermal Shock)	Repeat 1,000 cycles as follows: -55 ±3°C (30 min.) / +125 ±3°C (30 min.) Transition time of 1 minute maximum	±(1.0%+0.5mΩ) JESD22 Method JA-104
Biased Humidity	Test Condition: 85°C/85% RH 10% of rated power. Test period: 1,000 hours	±(1.0%+0.5mΩ) MIL-STD-202 Method 103
Load Life (Operational Life)	Test Temperature: 70°C ± 3°C Applied voltage: rated power Test period: 1,000 hours	±(1.0%+0.5mΩ) MIL-STD-202 Method 108
Resistance to solvents	3 minute soak 2-3 ounce force 10 strokes / repetition 3 repetitions	±(1.0%+0.5mΩ) MIL-STD-202 Method 215
Mechanical Shock	Force: 100G peak Test Duration: 6 milliseconds Half-sine waveform Velocity: 12.3 ft/sec	±(1.0%+0.5mΩ) MIL-STD-202 Method 213
Vibration	Frequency: 10 - 2,000Hz Acceleration: 5G Test Duration: 20 mins / 12 Cycles	±(1.0%+0.5mΩ) MIL-STD-202 Method 204
Resistance to Soldering Heat	Condition B (Solder Dip - no pre-heat) 260°C ±5°C	±(1.0%+0.5mΩ) MIL-STD-202 Method 210
ESD	HBM, 100pF, 1.5kΩ Repetition: 5 times	±(1.0%+0.5mΩ) AEC-Q200-002
Solderability	Non-activated Flux Dip: 5-10 seconds SAC Solder Dip: 5±0.5 seconds	The covered area >95% J-STD-002
Flammability	V-0 or V-1 are acceptable Electrical test not required	UL-94
Board Flex	90mm span between fulcrums 2mm bend 60 sec minimum holding time.	±(1.0%+0.5mΩ) AEC Q200-005
Terminal Strength (SMD)	Force of 17.7N 60 seconds	±(1.0%+0.5mΩ) AEC Q200-006

Storage Conditions:

Environmental Conditions:

Products should be stored under the following environmental conditions:

- Temperature: +5 to +40°C
- Humidity: 45 to 85% relative humidity
- Do not keep products in environments where they may be subject to particulate contamination or harmful gases such as sulfuric acid or hydrogen chloride as it may cause oxidization on electrodes, resulting in poor solderability.
- Products should be stored in a space that does not expose it to high temperatures, vibration, or direct sunlight.
- Products should be stored in the original airtight packaging until use.