VISHAY INTERTECHNOLOGY, INC.

INTERACTIVE
data book

POWER METAL STRIP® RESISTORS
VISHAY

VSE-DB0089-0804

Notes:

1. To navigate:
   a) Click on the Vishay logo on any datasheet to go to the Contents page for that section. Click on the Vishay logo on any Contents page to go to the main Table of Contents page.
   b) Click on the products within the Table of Contents to go directly to the datasheet.
   c) Use the scroll or page up/page down functions.
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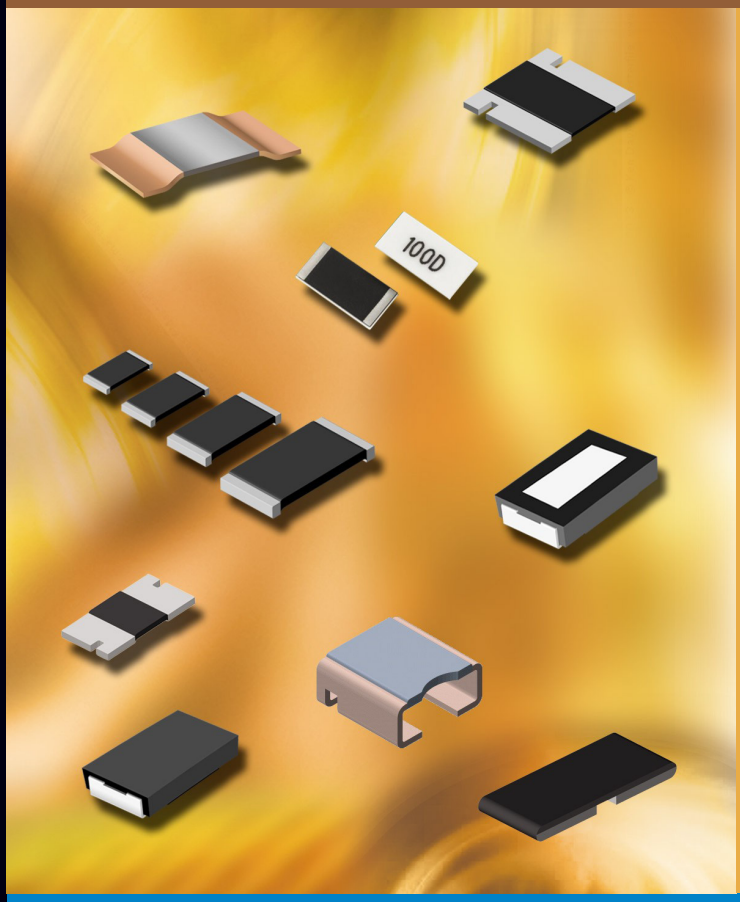
VISHAY INTERTECHNOLOGY, INC.



DATA BOOK

POWER METAL STRIP® RESISTORS

www.vishay.com

SEMICONDUCTORS

RECTIFIERS
- Schottky (single, dual)
- Standard, Fast, and Ultra-Fast Recovery (single, dual)
- Bridge
- Superectifier®
- Sinterglass Avalanche Diodes

HIGH-POWER DIODES AND THYRISTORS
- High-Power Fast-Recovery Diodes
- Phase-Control Thyristors
- Fast Thyristors

SMALL-SIGNAL DIODES
- Schottky and Switching (single, dual)
- Tuner/Capacitance (single, dual)
- Bandswitching
- PIN

ZENER AND SUPPRESSOR DIODES
- Zener (single, dual)
- TVS (TRANSZORB®, Automotive, ESD, Arrays)

FETs
- Low-Voltage TrenchFET® Power MOSFETs
- High-Voltage TrenchFET® Power MOSFETs
- High-Voltage Planar MOSFETs
- JFETs

RF TRANSISTORS
- Bipolar Transistors (AF and RF)
- Dual Gate MOSFETs
- MOSMICs®

OPTOELECTRONICS
- IR Emitters and Detectors, and IR Receiver Modules
- Optocouplers and Solid-State Relays
- Optical Sensors
- LEDs and 7-Segment Displays
- Infrared Data Transceiver Modules
- Custom Products

ICs
- Power ICs
- Analog Switches
- RF Transceivers and Receiver Modules
- ICs for Optoelectronics

MODULES AND ASSEMBLIES
- Automotive Modules and Assemblies
- Power Modules (contain power diodes, thyristors, MOSFETs, IGBTs)
- DC/DC Converters

PASSIVE COMPONENTS

RESISTIVE PRODUCTS
- Foil Resistors
- Film Resistors
  - Metal Film Resistors
  - Thin Film Resistors
  - Thick Film Resistors
  - Metal Oxide Film Resistors
  - Carbon Film Resistors
- Wirewound Resistors
- Power Metal Strip® Resistors
- Chip Fuses
- Variable Resistors
  - Cermet Variable Resistors
  - Wirewound Variable Resistors
  - Conductive Plastic Variable Resistors
- Networks/Arrays
- Non-Linear Resistors
  - NTC Thermistors
  - PTC Thermistors
  - Varistors

MAGNETICS
- Inductors
- Transformers

CAPACITORS
- Tantalum Capacitors
  - Molded Chip Tantalum Capacitors
  - Coated Chip Tantalum Capacitors
  - Solid Through-Hole Tantalum Capacitors
  - Wet Tantalum Capacitors
- Ceramic Capacitors
  - Multilayer Chip Capacitors
  - Disc Capacitors
- Film Capacitors
- Power Capacitors
- Heavy-Current Capacitors
- Aluminum Capacitors
- Silicon RF Capacitors

STRAIN GAGE TRANSDUCERS AND STRESS ANALYSIS SYSTEMS
- PhotoStress®
- Strain Gages
- Load Cells
- Force Transducers
- Instruments
- Weighing Systems
- Specialized Strain Gage Systems

Power Metal Strip® Resistors

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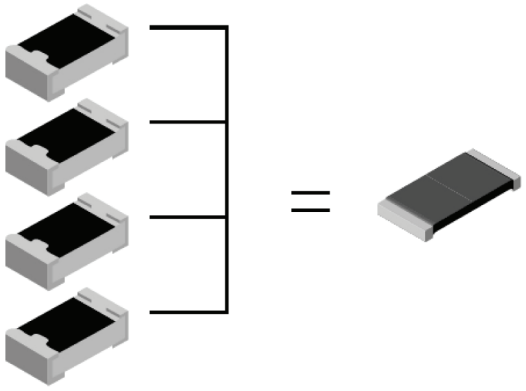
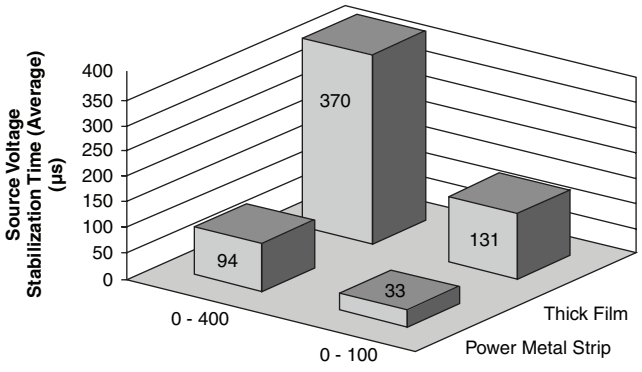
Power Metal Strip® Resistors

VERY LOW OHMIC VALUE

To maximize energy conversion efficiency and minimize power consumption, current sense resistors should be of the lowest resistance value possible (typically below 25 mΩ). The single Power Metal Strip resistor can achieve the same low ohmic values for which four to six conventional cermet chips or two or more conventional thin film chips are required.



Multiple Chip **Single Power Metal Strip**



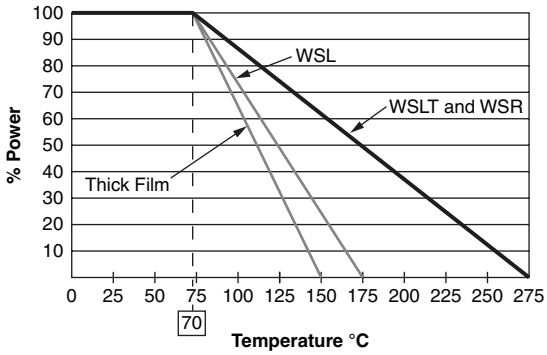
TIGHT TOLERANCE (1 % STANDARD, 0.5 % AVAILABLE)

For maximizing the sensing performance and saving energy, the tolerance of the sense resistor must be ± 1 % or tighter. 1 % tolerance allows designers to use a narrow resistance window when specifying sensing voltages. Another advantage of 1 % or better tolerance is reduced response time to switching currents. The chart to the left shows that it takes a compareable thick film resistor almost three times longer than the Power Metal Strip to stabilize it's sensing voltage.

HIGH TEMPERATURE CAPABILITY (UP TO + 275 °C)

When used in industrial and automotive applications, components may be exposed to high temperatures. The current sensing resistor must be capable of operating in high temperature conditions with a minimal reduction (derating) of rated power. The Vishay Dale WSL (maximum of 275 °C) type resistors will withstand high temperatures much better than cermet chips. The chart to the right provides a high temperature comparison of these device types.

Power Metal Strip
High-Temperature Capability

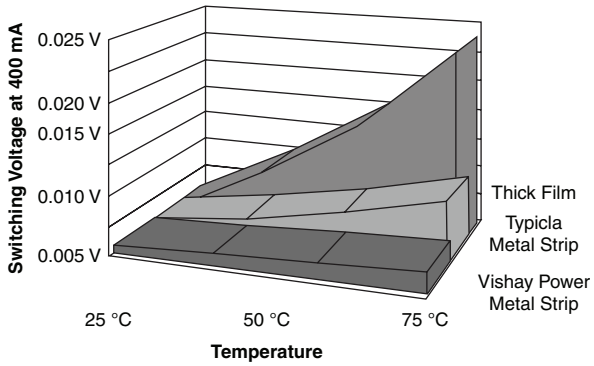


For technical questions, contact: ww2bresistors@vishay.com

LOW TEMPERATURE COEFFICIENT OF RESISTANCE (TCR) (DOWN TO 30 PPM/°C)

The low TCR of Vishay Power Metal Strip resistors minimizes the resistance change caused by self heating and high temperature environments.

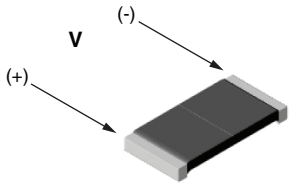
This chart illustrates voltage of a 30 ppm/°C Vishay Power Metal Strip® resistors compared to a typical 100 ppm/°C metal strip and 700 ppm/°C thick film chip.



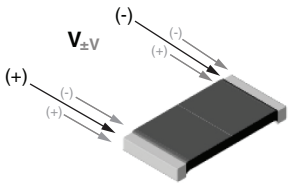
LOW THERMAL EMF (BELOW 1 µV/°C)	
METAL ALLOY	**THERMAL EMF VS. COPPER µV/°C**
Evanohm	+ 2
Cupron	- 45
Manganin	- 3
Zeranin	- 1.3
Nickel	- 22
Gold	+ 0.2
Silver	- 0.2
Aluminum	- 4

Dissimilar metals, in contact with each other, produces a small voltage. This voltage varies with temperature and is therefore called a “Thermal EMF”, or “thermocouple effect”. The rate of change of voltage with temperature from an intermetallic junction is a function of the metallic combination and the polarity of the voltage produced.
Virtually all resistors have intermetallic combinations and it is presumed will eventually be connected to copper as a final intermetallic junction (circuit trace). Hence, copper is typical reference metal.

Thermal EMF is an important consideration in low value resistors used in DC circuits. Thermal EMF can be large enough, when compared to the expected signal, that it can result in large sensing error. Vishay’s Power Metal Strip current sensing resistors utilize resistance materials that have low Thermal EMF characteristics (below µV/°C).



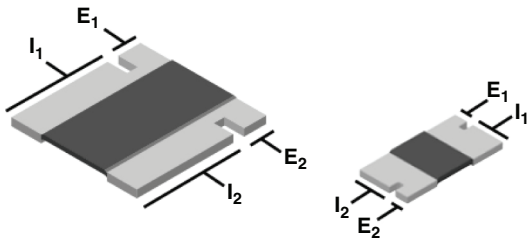
V = Voltage Drop
(no thermal EMF effect)



$V_{\pm V}$ = Voltage Drop
(with (±V) thermal EMF effect)

TERMINAL CONSTRUCTION

At resistance levels down to 1 mΩ and tolerance of 1 % or larger, a two-terminal construction is typically acceptable. Where better accuracy is required, Vishay recommends the use of the four-terminal WSK2512 or WSL3637. The four-terminal construction reduces terminal resistance, copper terminal TCR, and solder joint TCR.



(E_1 and E_2 Voltage Connections, I_1 and I_2 Current Connections)

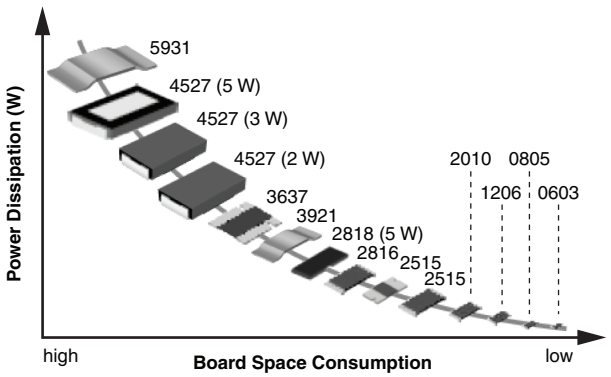
HIGH CURRENT CAPABILITY (MORE THAN 125 A)

The maximum DC load current required by today's application is in excess of 70 A. Vishay's Power Metal Strip current sensing resistors utilize solid metal resistance elements which are capable of handling the highest load currents.

MULTIPLE PACKAGE SIZE (0603 TO 5913)

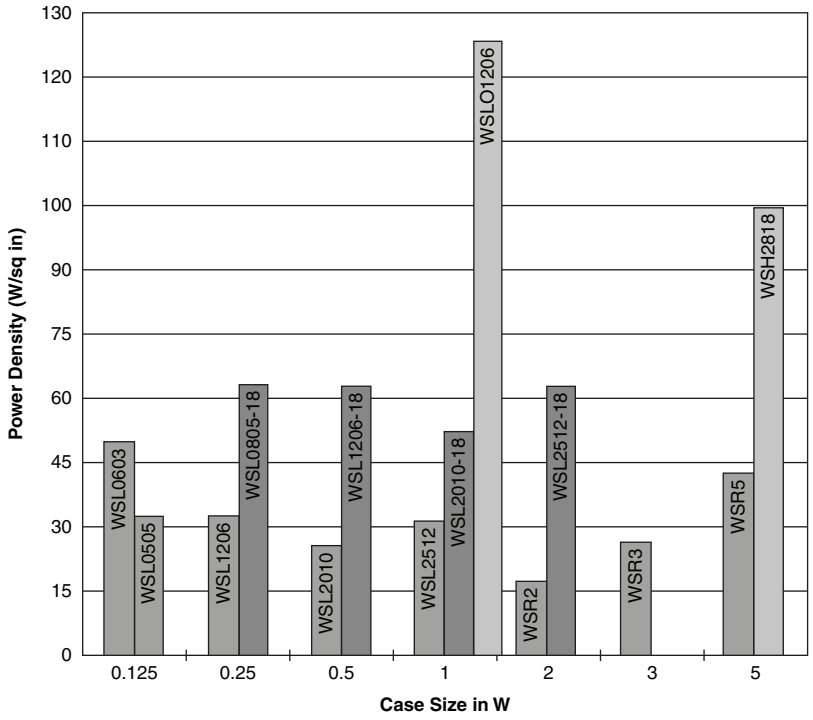
Vishay's Power Metal Strip resistors are available in more than 10 package sizes. Multiple package sizes give the customer the ability to minimize PCB space by utilizing a smaller component or lessen resistor temperature by utilizing a larger component for their current sense applications.

Multiple Package Sizes (0603 to 5931)



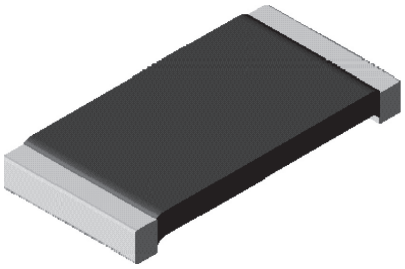
HIGH POWER DENSITY (UP TP 120 W/IN^2)

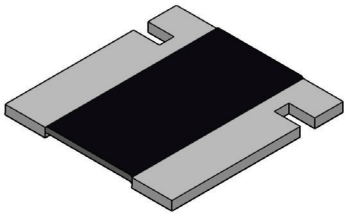
Vishay's Power Metal Strip resistors have envolved to "High Power" WSL...-18, WSLP1206, WSR3, WSR5 and WSH2818 type resistors. With the higher power capacity of standard WSL and WSR2 type resistor series, the WSL...-18, WSLP1206, WSR3 and WSH2818 series are intended for high power, current sensing applications. Specially selected materials permit these high power ratings of up to 5 W. The WSL...-18, WSLP1206, WSR3, WSR5 and WSH2818 resistors offer a high power-to-package size ratio while maintaining superior electrical characteristics. These high power ratings enable designers to use smaller PCBs, which in turn increases manufactoring speed and reduces raw material costs.



Power Metal Strip® Resistors

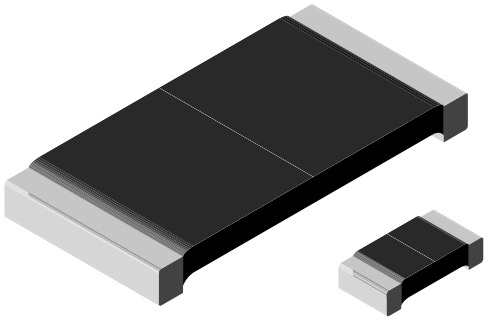
Surface Mount





Contents

Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount



FEATURES

- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers
- Proprietary processing technique produces extremely low resistance values (down to 0.001 Ω)
- All welded construction
- Solid metal Nickel-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)
- Lead (Pb)-free version is RoHS compliant

Pb-free Available

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	RESISTANCE RANGE Ω		WEIGHT (typical) g/1000 pieces
		± 0.5 %	± 1.0 %	
WSL0603	0.1	0.015 - 0.1	0.015 - 0.1	1.9
WSL0805	0.125	0.01 - 0.2	0.01 - 0.2	4.8
WSL1206	0.25	0.006 - 0.2	0.001 - 0.2	16.2
WSL2010	0.5	0.004 - 0.5	0.001 - 0.5	38.9
WSL2512	1.0 (1)	0.003 - 0.5	0.001 - 0.5	63.6
WSL2816	2.0	0.01 - 0.1	0.01 - 0.1	118

Notes

(1) For values above 0.1 Ω derate linearly to 80 % rated power at 0.5 Ω

- Part Marking: DALE, Value, Tolerance: due to resistor size limitations some resistors will be marked with only the resistance value

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSL RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 275 for 1 mΩ to 2.9 mΩ, ± 150 for 3 mΩ to 4.9 mΩ ± 110 for 5 mΩ to 6.9 mΩ, ± 75 for 7 mΩ to 0.5 Ω
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$

GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSL25124L000FTA (PREFFERRED PART NUMBERING FORMAT)

W	S	L	2	5	1	2	4	L	0	0	0	F	T	A		

GLOBAL MODE	VALUE	TOLERANCE CODE	PACKAGING	SPECIAL
WSL0603 WSL0805 WSL1206 WSL2010 WSL2512 WSL2816	**L** = mΩ* **R** = Decimal **5L000** = 0.005 Ω **R0100** = 0.01 Ω * use "**L**" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 % **J** = ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TA** = Tin/lead, tape/reel (R86) **TG** = Tin/lead, tape/reel (RT1) **BA** = Tin/lead, bulk (B43)	(Dash Number) (up to 2 digits) From **1 - 99** as applicable

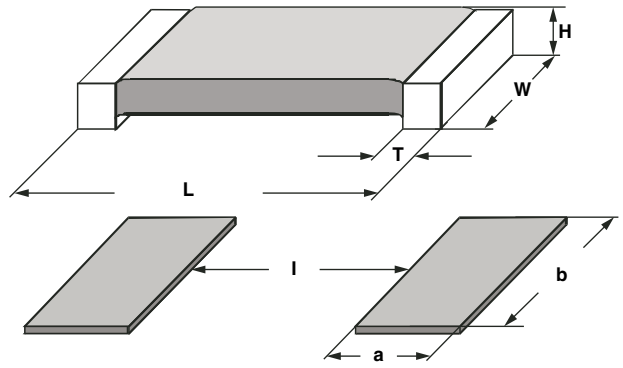
HISTORICAL PART NUMBER EXAMPLE: WSL2512 0.004 Ω 1 % R86 (WILL CONTINUE TO BE ACCEPTED)

WSL2512	0.004 Ω	1 %	R86
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

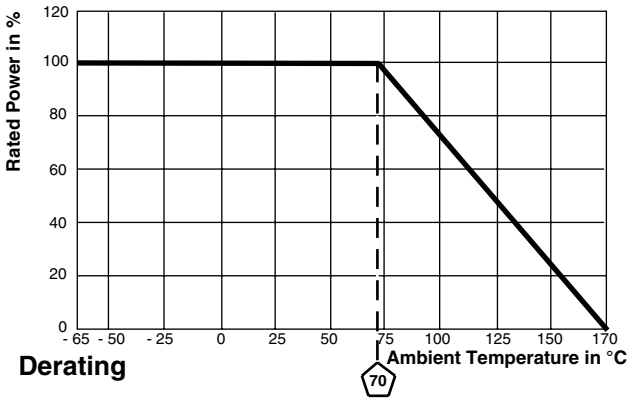
* Pb containing terminations are not RoHS compliant, exemptions may apply

Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]				
	RESISTANCE RANGE Ω	L	W	H	T
WSL0603	0.015 - 0.1	0.060 ± 0.010 [1.52 ± 0.254]	0.030 ± 0.010 [0.76 ± 0.254]	0.013 ± 0.005 [0.330 ± 0.127]	0.015 ± 0.010 [0.381 ± 0.254]
WSL0805	0.01 - 0.2	0.080 ± 0.010 [2.03 ± 0.254]	0.050 ± 0.010 [1.27 ± 0.254]	0.013 ± 0.005 [0.330 ± 0.127]	0.015 ± 0.010 [0.381 ± 0.254]
WSL1206	0.002 - 0.2	0.126 ± 0.010 [3.20 ± 0.254]	0.063 ± 0.010 [1.60 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.020 ± 0.010 [0.508 ± 0.254]
WSL2010	0.001 - 0.0069	0.200 ± 0.010 [5.08 ± 0.254]	0.100 ± 0.010 [2.54 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.058 ± 0.010 [1.47 ± 0.254]
	0.007 - 0.5	0.200 ± 0.010 [5.08 ± 0.254]	0.100 ± 0.010 [2.54 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.020 ± 0.010 [0.508 ± 0.254]
WSL2512	0.001 - 0.0049	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.087 ± 0.010 [2.21 ± 0.254]
	0.005 - 0.0069	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.047 ± 0.010 [1.19 ± 0.254]
	0.007 - 0.5	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.030 ± 0.010 [0.762 ± 0.254]
WSL2816	0.01 - 0.1	0.280 ± 0.010 [7.1 ± 0.254]	0.165 ± 0.010 [4.2 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.062 ± 0.010 [1.57 ± 0.254]



Derating

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]			
	RESISTANCE RANGE Ω	a	b	l
WSL0603	0.015 - 0.1	0.040 [1.01]	0.040 [1.01]	0.020 [0.50]
WSL0805	0.01 - 0.2	0.040 [1.02]	0.050 [1.27]	0.020 [0.50]
WSL1206	0.002 - 0.2	0.050 [1.27]	0.070[1.78]	0.055 [1.40]
WSL2010	0.001 - 0.0069	0.093 [2.36]	0.120 [3.05]	0.055 [1.40]
	0.007 - 0.5	0.055 [1.40]	0.120 [3.05]	0.130 [3.30]
WSL2512	0.001 - 0.0049	0.120 [3.05]	0.145 [3.68]	0.050 [1.27]
	0.005 - 0.0069	0.083 [2.11]	0.145 [3.68]	0.125 [3.18]
	0.007 - 0.5	0.065 [1.65]	0.145 [3.68]	0.160 [4.06]
WSL2816	0.01 - 0.1	0.130 [3.3]	0.190 [4.8]	0.040 [1.00]

PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Operation	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

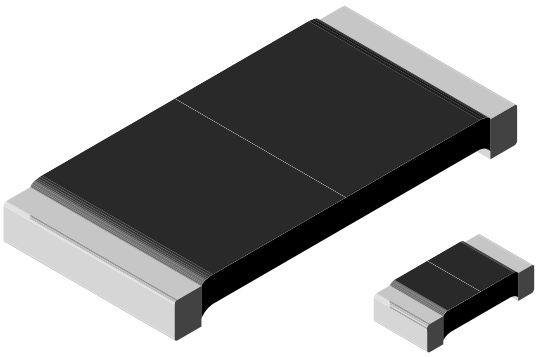
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL0603	8 mm/Punched Paper	178 mm/7"	5000	EA
WSL0805	8 mm/Punched Paper	178 mm/7"	5000	EA
WSL1206	8 mm/Embossed Plastic	178 mm/7"	4000	EA
WSL2010	12 mm/Embossed Plastic	178 mm/7"	4000	EA
WSL2512	12 mm/Embossed Plastic	178 mm/7"	2000	EA
WSL2816	16 mm/Embossed Plastic	330 mm/13"	5000	EA

Note

- Embossed carrier tape per EIA-481-1A

Power Metal Strip® Resistors, High Power (2 x Standard WSL), Low Value (down to 0.001 Ω), Surface Mount



FEATURES

- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers
- Proprietary processing technique produces extremely low resistance values (down to 0.001 Ω)
- Specially selected and stabilized materials allow for high power ratings (2 x standard WSL rating)
- All welded construction
- Solid metal Nickel-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)
- Lead (Pb)-free version is RoHS compliant

Pb-free Available

e3

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\ °C}$ W	RESISTANCE RANGE Ω		WEIGHT (typical) g/1000 pieces
		± 0.5 %	± 1.0 %	
WSL0603...18	0.20	0.015 - 0.1	0.015 - 0.1	1.9
WSL0805...18	0.25	0.01 - 0.2	0.01 - 0.2	4.8
WSL1206...18	0.5	0.006 - 0.2	0.001 - 0.2	16.2
WSL2010...18	1.0	0.004 - 0.5	0.001 - 0.5	38.9
WSL2512...18	2.0	0.003 - 0.01	0.001 - 0.01	63.6

Note

- Part Marking: DALE, Value, Tolerance: due to resistor size limitations some resistors will be marked with only the resistance value

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSL RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 275 for 1 mΩ to 2.9 mΩ, ± 150 for 3 mΩ to 4.9 mΩ ± 110 for 5 mΩ to 6.9 mΩ, ± 75 for 7 mΩ to 0.5 Ω
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$

GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSL25124L000FTA18 (PREFERRED PART NUMBERING FORMAT)

W	S	L	2	5	1	2	4	L	0	0	0	F	T	A	1	8

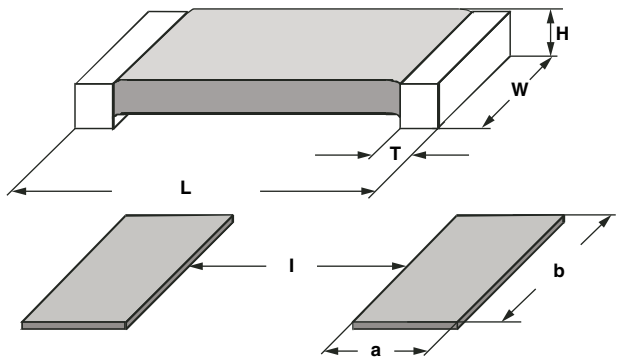
GLOBAL MODEL	VALUE	TOLERANCE CODE	PACKAGING	SPECIAL
WSL0603 WSL0805 WSL1206 WSL2010 WSL2512	**L** = mΩ* **R** = Decimal **5L000** = 0.005 Ω **R0100** = 0.01 Ω * use "**L**" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 % **J** = ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TA** = Tin/lead, tape/reel (R86) **TG** = Tin/lead, tape/reel (RT1) **BA** = Tin/lead, bulk (B43)	**18** = "High Power" option

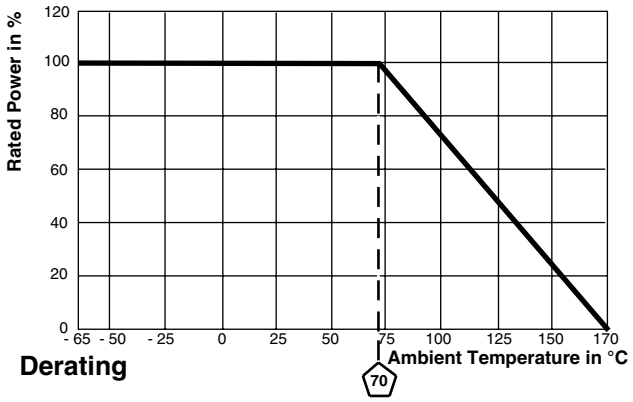
HISTORICAL PART NUMBER EXAMPLE: WSL2512-18 0.004 Ω 1 % R86 (WILL CONTINUE TO BE ACCEPTED)

WSL2512-18	0.004 Ω	1 %	R86
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

* Pb containing terminations are not RoHS compliant, exemptions may apply

DIMENSIONS





MODEL	DIMENSIONS in inches [millimeters]				
	RESISTANCE RANGE Ω	L	W	H	T
WSL0603-18	0.015 - 0.1	0.060 ± 0.010 [1.52 ± 0.254]	0.030 ± 0.010 [0.76 ± 0.254]	0.015 ± 0.005 [0.38 ± 0.127]	0.015 ± 0.010 [0.38 ± 0.254]
WSL0805-18	0.01 - 0.2	0.080 ± 0.010 [2.03 ± 0.254]	0.050 ± 0.010 [1.27 ± 0.254]	0.013 ± 0.005 [0.330 ± 0.127]	0.015 ± 0.010 [0.381 ± 0.254]
WSL1206-18	0.002 - 0.2	0.126 ± 0.010 [3.20 ± 0.254]	0.063 ± 0.010 [1.60 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.020 ± 0.010 [0.508 ± 0.254]
WSL2010-18	0.001 - 0.0069	0.200 ± 0.010 [5.08 ± 0.254]	0.100 ± 0.010 [2.54 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.058 ± 0.010 [1.47 ± 0.254]
	0.007 - 0.5	0.200 ± 0.010 [5.08 ± 0.254]	0.100 ± 0.010 [2.54 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.020 ± 0.010 [0.508 ± 0.254]
WSL2512-18	0.001 - 0.0049	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.087 ± 0.010 [2.21 ± 0.254]
	0.005 - 0.0069	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.047 ± 0.010 [1.19 ± 0.254]
	0.007 - 0.01	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.030 ± 0.010 [0.762 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]			
	RESISTANCE RANGE Ω	a	b	l
WSL0603-18	0.015 - 0.1	0.040 [1.01]	0.040 [1.01]	0.020 [0.50]
WSL0805-18	0.01 - 0.2	0.040 [1.02]	0.050 [1.27]	0.020 [0.50]
WSL1206-18	0.002 - 0.2	0.050 [1.27]	0.070 [1.78]	0.055 [1.40]
WSL2010-18	0.001 - 0.0069	0.093 [2.36]	0.120 [3.05]	0.055 [1.40]
	0.007 - 0.5	0.055 [1.40]	0.120 [3.05]	0.130 [3.30]
WSL2512-18	0.001 - 0.0049	0.120 [3.05]	0.145 [3.68]	0.050 [1.27]
	0.005 - 0.0069	0.083 [2.11]	0.145 [3.68]	0.125 [3.18]
	0.007 - 0.01	0.065 [1.65]	0.145 [3.68]	0.160 [4.06]

PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

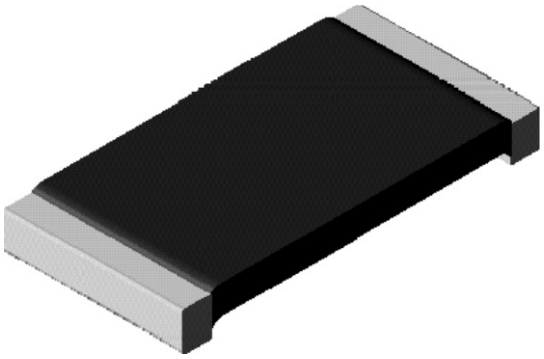
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL0603-18	8 mm/Punched Paper	178 mm/7"	5000	EA
WSL0805-18	8 mm/Punched Paper	178 mm/7"	5000	EA
WSL1206-18	8 mm/Embossed Plastic	178 mm/7"	4000	EA
WSL2010-18	12 mm/Embossed Plastic	178 mm/7"	4000	EA
WSL2512-18	12 mm/Embossed Plastic	178 mm/7"	2000	EA

Note

- Embossed carrier tape per EIA-481-1A

Power Metal Strip® Resistors, Very High Power (1 W) Low Value (down to 0.001 Ω), Surface Mount



FEATURES

- Very high power to foot print size ratio (1 W in 1206 package)
- Ideal for all types of current sensing and pulse applications including switching and linear power supplies, instruments, power amplifiers and shunts
- Proprietary processing technique produces extremely low resistance values (down to 0.001 Ω)
- All welded construction
- Solid metal Nickel-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free

e3

RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	RESISTANCE RANGE Ω		WEIGHT (typical) g/1000 pieces
		± 0.5 %	± 1.0 %	
WSLP1206	1.0	0.01 - 0.05	0.001 - 0.05	16.2

Note

- Part Marking: Value

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSLP1206
Temperature Coefficient	ppm/°C	± 75
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$

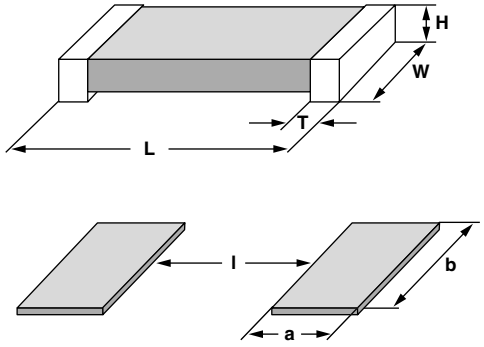
GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSLP1206R0100FEA

W	S	L	P	1	2	0	6	R	0	1	0	0	F	E	A		

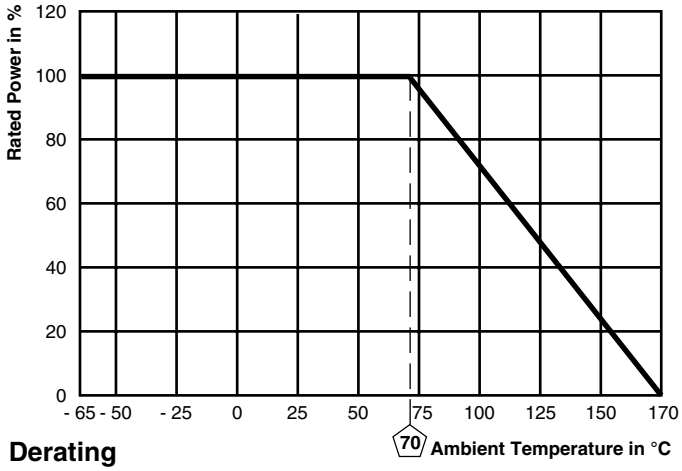
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSLP1206	**L** = mΩ* **R** = Decimal **4L000** = 0.004 Ω **R0100** = 0.01 Ω * use "**L**" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	Reserved for future specials

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]			
	L	W	H	T
WSLP1206	0126 ± 0.010 [3.20 ± 0.254]	0.063 ± 0.010 [1.60 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.020 ± 0.010 [0.508 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	a	b	l
WSLP1206	0.062 [1.57]	0.070 [1.78]	0.030 [0.76]



Derating

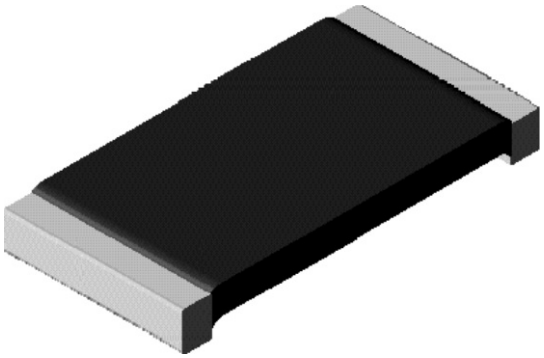
PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Operation	- 65 °C for 45 min	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

PACKAGING				
MODEL	**REEL**			
	TAPE WIDTH	**DIAMETER**	**PIECES/REEL**	**CODE**
WSLP1206	8 mm/Embossed Plastic	178 mm/7"	4000	EA

Note

- Embossed Carrier Tape per EIA-481-2

Improved Stability (0.5 %), Power Metal Strip® Resistors Low Value (0.01 Ω to 0.1 Ω), Surface Mount



FEATURES

- Current sensing in high-temperature (+ 125 °C) applications
- Greater stability with maximum resistance change of 0.5 % through a 2000 h workload
- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers and shunts
- Proprietary processing technique produces extremely low resistance values (0.01 Ω to 0.1 Ω)
- Durable with all welded construction
- Solid metal Nickel-Chrome resistive element with low TCR (< 20 ppm/°C)
- Lead (Pb)-free construction is RoHS compliant
- Very low inductance 0.5 nH to 2 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free

e3

RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\ °C}$ W	RESISTANCE RANGE Ω ± 1.0 %	WEIGHT (typical) g/1000 pieces
WSLS2512	1.0	0.01 - 0.1	63.6

Note

- Part Marking: Value, Tolerance Code

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSLS2512 RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 75
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$

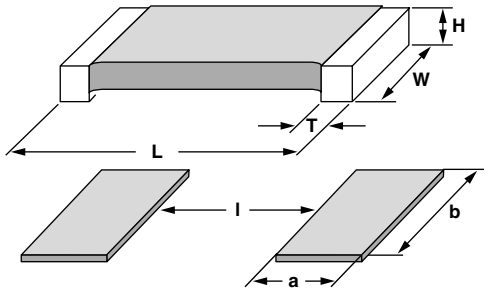
GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: WSLS2512R0100FEA

W	S	L	S	2	5	1	2	R	0	1	0	0	F	E	A		

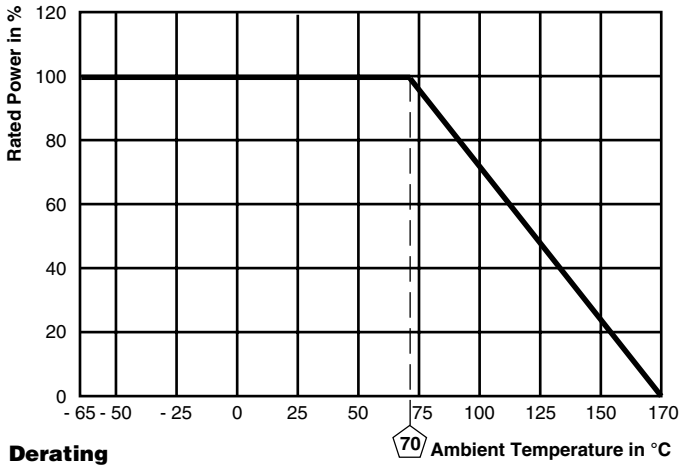
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSLS2512	**R** = Decimal **R0100** = 0.01 Ω	**F** = ± 1.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	(Dash Number) (up to 2 digits) From **1 - 99** as applicable

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]			
	L	W	H	T
WSLS2512	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.030 ± 0.010 [0.762 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	a	b	l
WSLS2512	0.065 [1.65]	0.145 [3.68]	0.160 [4.06]



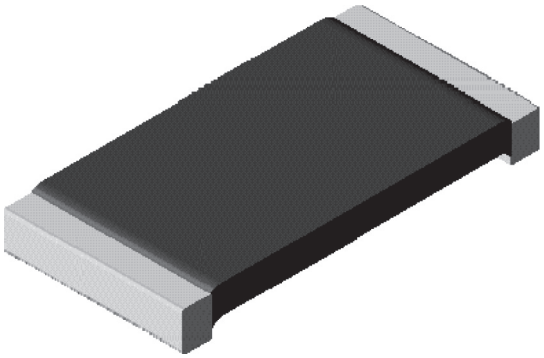
PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Operation	- 65 °C for 45 min	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	2000 h at 70 °C, 1.5 h "ON", 0.5 h "OFF"	± 0.5 % Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

PACKAGING				
MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSLS2512	12 mm/Embossed Plastic	178 mm/7"	2000	EA

Note

- Embossed Carrier Tape per EIA-481-2

Power Metal Strip® Resistors, High Temperature (275 °C) Low Value (down to 0.01 Ω), Surface Mount



FEATURES

- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments and power amplifiers
- Proprietary processing technique produces extremely low resistance values
- Specially selected and stabilized materials allow for high temperature derating (to + 275 °C)
- All welded construction
- Solid metal Nickel-Chrome alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance (< 5 nH)
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free

e3

RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\ °C}$ W	RESISTANCE RANGE Ω		WEIGHT (Typical) g/1000 pieces
		± 0.5 %	± 1.0 %	
WSLT2512	1.0	0.01 - 0.50	0.01 - 0.50	63.6

Note

- Part Marking: DALE, Value, Tolerance Code

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSLT2512
Temperature Coefficient	ppm/°C	± 75
Inductance	nH	< 5
Operating Temperature Range	°C	- 65 to + 275
Maximum Continuous Current	A	$(P/R)^{1/2}$

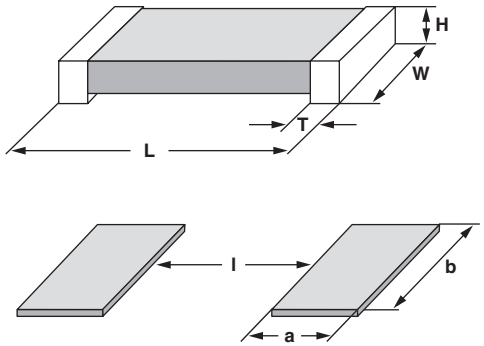
GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSLT2512R0100FEA

W	S	L	T	2	5	1	2	R	0	1	0	0	F	E	A		

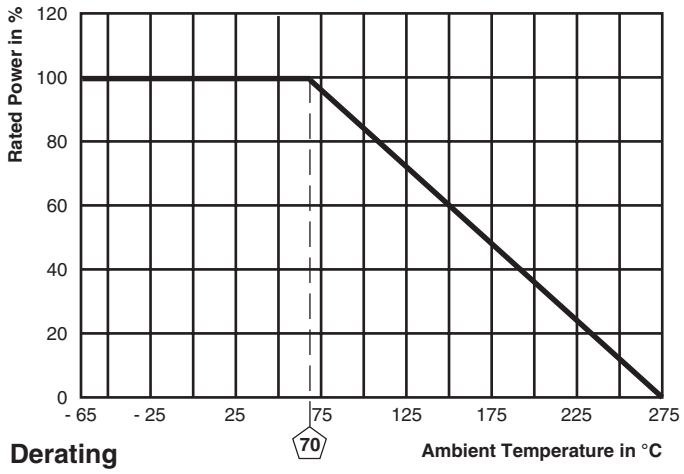
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSLT2512	**L** = mΩ* **R** = Decimal **4L000** = 0.004 Ω **R0100** = 0.01 Ω * use "**L**" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	Reserved for future specials

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]			
	L	W	H	T
WSLT2512	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.030 ± 0.010 [0.762 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	a	b	l
WSLT2512	0.083 [1.65]	0.145 [3.68]	0.160 [4.06]



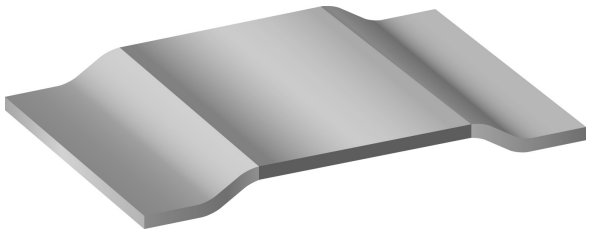
PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± 0.5 % ΔR
Short Time Overload	5 × rated power for 5 s	± 0.5 % ΔR
Low Temperature Operation	- 65 °C for 45 min	± 0.5 % ΔR
High Temperature Exposure	1000 h at + 275 °C	± 1.0 % ΔR
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± 0.5 % ΔR
Mechanical Shock	100 g's for 6 ms, 5 pulses	± 0.5 % ΔR
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± 0.5 % ΔR
Load Life at 70 °C	1000 h, 1.5 h "ON", 0.5 h "OFF"	± 1.0 % ΔR
Load Life at 150 °C	1000 h, 1.5 h "ON", 0.5 h "OFF"	± 1.0 % ΔR
Resistance to Solder Heat	260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± 0.5 % ΔR
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± 1.0 % ΔR

PACKAGING				
MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSLT2512	12 mm/Embossed Plastic	178 mm/7"	2000	EA

Note

- Embossed Carrier Tape per EIA-481-2

Power Metal Strip® Resistors, Low Value (down to 0.0002 Ω), Surface Mount



FEATURES

- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers
- Proprietary processing technique produces extremely low resistance values, down to 0.0002 Ω
- All welded construction
- Solid metal Iron-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)
- 100 % lead (Pb)-free and RoHS compliant

Pb-free

RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE %	RESISTANCE VALUES AVAILABLE mΩ	WEIGHT (typical) g/1000 pieces
WSL3921	3.0	1.0 and 5.0	0.3, 0.5, 1, 2, 3, 4	281
WSL5931	5.0	1.0 and 5.0	0.2, 0.3, 0.5, 1, 2, 3	398

Note

- Part Marking: no part marking on these parts

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSL RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 225 for 0.2 mΩ, ± 175 for 0.3 mΩ and 0.5 mΩ, ± 75 for 1 mΩ to 4 mΩ
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$

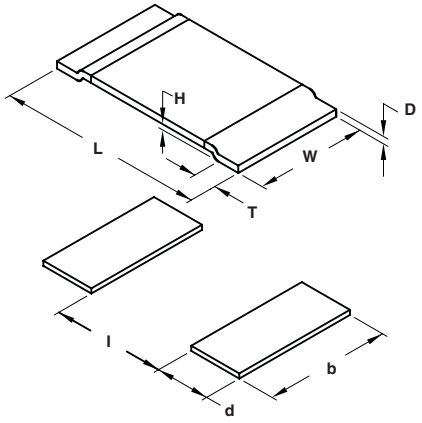
GLOBAL PART NUMBER INFORMATION

GLOBAL PART NUMBERING: WSL3921L5000FEA

W	S	L	3	9	2	1	L	5	0	0	0	F	E	A		

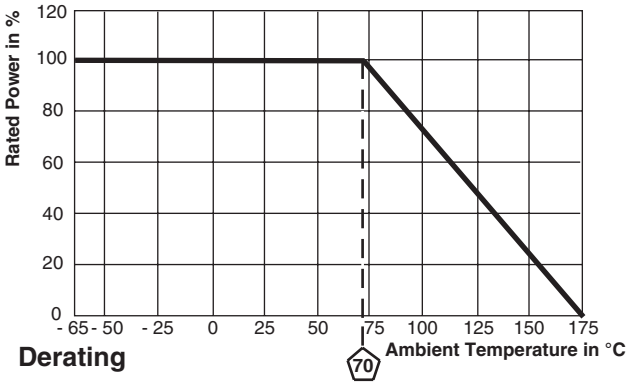
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSL3921 **WSL5931**	**L** = mΩ **L5000** = 0.0005 Ω	**F** = ± 1.0 % **J** = ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	(Dash Number) (up to 2 digits) From **1 - 99** as applicable

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]			
	L	W	H	T
WSL3921	0.394 ± 0.010	0.205 ± 0.010 [5.20 ± 0.254]	0.020 [0.5]	0.080 ± 0.010 [2.00 ± 0.254]
WSL5931	0.591 ± 0.010	0.305 ± 0.010 [7.75 ± 0.254]	0.020 [0.5]	0.157 ± 0.010 [4.00 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	d	b	l
WSL3921	0.106 ± 0.010 [2.70 ± 0.254]	0.244 ± 0.010 [6.20 ± 0.254]	0.220 ± 0.005 [5.60 ± 0.13]
WSL5931	0.205 ± 0.010 [5.20 ± 0.254]	0.344 ± 0.010 [8.75 ± 0.254]	0.220 ± 0.005 [5.60 ± 0.13]



GLOBAL MODEL	RESISTANCE VALUE	"D" THICKNESS	ELEMENT MATERIAL
WSL3921	0.3	0.0510	Mn-Cu
WSL3921	0.5	0.0300	Mn-Cu
WSL3921	1.0	0.0150	Mn-Cu
WSL3921	2.0	0.0270	Fe-Cr
WSL3921	3.0	0.0170	Fe-Cr
WSL3921	4.0	0.0130	Fe-Cr
WSL5931	0.2	0.0485	Mn-Cu
WSL5931	0.3	0.0300	Mn-Cu
WSL5931	0.5	0.0180	Mn-Cu
WSL5931	1.0	0.0330	Fe-Cr
WSL5931	2.0	0.0155	Fe-Cr
WSL5931	3.0	0.0105	Fe-Cr

PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (1.0 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 45 min	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 175 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

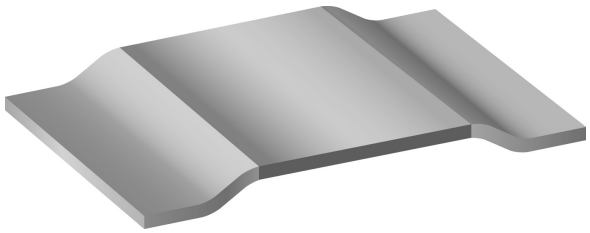
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL3921	16 mm/Embossed Plastic	330 mm/13"	3000	EA
WSL5931	16 mm/Embossed Plastic	330 mm/13"	1500	EA

Note

- Embossed carrier tape per EIA-481-1A

Power Metal Strip® Resistors, High Temperature (275 °C) Low Value (down to 0.001 Ω), Surface Mount



FEATURES

- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments and power amplifiers
- Proprietary processing technique produces extremely low resistance values, down to 0.001 Ω
- Specially selceted and stabilized materials allow for high temperature derating (to + 275 °C)
- All welded construction
- Solid metal nickel-chrome alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance (< 5 ηH)
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 μV/°C)

Pb-free

RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\ °C}$	TOLERANCE %	RESISTANCE VALUES AVAILABLE mΩ	WEIGHT (typical) g/1000 pieces
WSLT3921	3.0	1.0 and 5.0	2, 3, 4	281
WSLT5931	5.0	1.0 and 5.0	1, 2, 3	398

Note

- Part Marking: no part marking on these parts

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSLT3921 AND WSLT5931
Temperature Coefficient	ppm/°C	± 75
Operating Temperature Range	°C	- 65 to + 275
Maximum Working Voltage	A	$(P/R)^{1/2}$

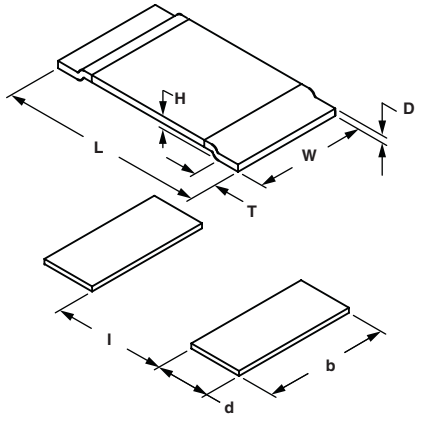
GLOBAL PART NUMBER INFORMATION

GLOBAL PART NUMBERING: WSLT39212L000FEA

W	S	L	T	3	9	2	1	2	L	0	0	0	F	E	A		

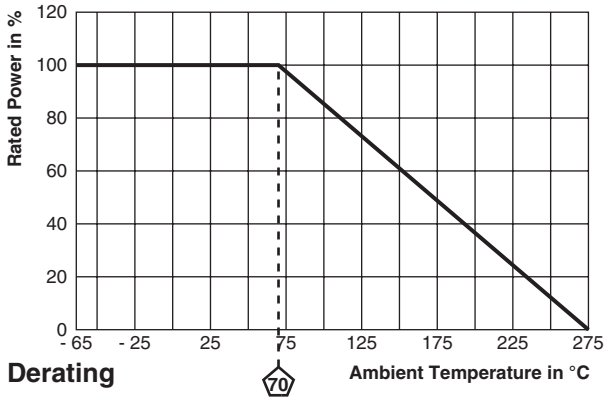
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSLT3921 **WSLT5931**	**L** = mΩ **2L000** = 0.002 Ω	**F** = ± 1.0 % **J** = ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	Reserved for future specials

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]			
	L	W	H	T
WSLT3921	0.394 ± 0.010 [10.0 ± 0.254]	0.205 ± 0.010 [5.20 ± 0.254]	0.020 [0.5]	0.080 ± 0.010 [2.00 ± 0.254]
WSLT5931	0.591 ± 0.010 [15.0 ± 0.254]	0.305 ± 0.010 [7.75 ± 0.254]	0.020 ± 0.010 [0.5]	0.157 ± 0.010 [4.00 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	d	b	L
WSLT3921	0.106 ± 0.010 [2.70 ± 0.254]	0.244 ± 0.010 [6.20 ± 0.254]	0.220 ± 0.005 [5.60 ± 0.13]
WSLT5931	0.205 ± 0.010 [5.20 ± 0.254]	0.344 ± 0.010 [8.75 ± 0.254]	0.220 ± 0.005 [5.60 ± 0.13]



GLOBAL MODEL	RESISTANCE VALUE mΩ	"D" THICKNESS	ELEMENT MATERIAL
WSLT3921	2.0	0.0270	Fe-Cr
WSLT3921	3.0	0.0170	Fe-Cr
WSLT3921	4.0	0.0130	Fe-Cr
WSLT5931	1.0	0.0330	Fe-Cr
WSLT5931	2.0	0.0155	Fe-Cr
WSLT5931	3.0	0.0105	Fe-Cr

PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (1.0 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 45 min	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 275 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

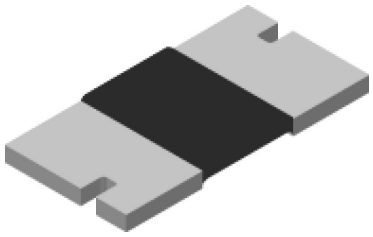
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSLT3921	16 mm/embossed plastic	330 mm/13"	3000	EA
WSLT5931	16 mm/embossed plastic	330 mm/13"	1500	EA

Note

- Embossed carrier tape per EIA-481-2

Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount, 4-Terminal



FEATURES

- 4-Terminal design allows for 1 % tolerance down to 0.001 Ω and 0.5 % tolerance down to 0.003 Ω
- Ideal for all types of precision current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers
- Proprietary processing technique produces extremely low resistance values (down to 0.001 Ω)
- All welded construction
- Solid metal Nickel-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Lead (Pb)-free version is RoHS compliant

Pb-free Available

e3

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	RESISTANCE RANGE Ω	
		± 0.5 %	± 1.0 %
WSK2512	1.0	0.003 - 0.025	0.001 - 0.025

Note

- Part Marking: DALE, Value, Tolerance; due to resistor size limitations some resistance values will be marked with only the resistance value

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSK2512
Temperature Coefficient	ppm/°C	0.001 Ω - 0.0029 Ω = ± 250 0.003 Ω - 0.0049 Ω = ± 75 0.005 Ω - 0.025 Ω = ± 35
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Weight/1000 pieces	g	63.6

GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSK25125L000FTA (PREFERRED PART NUMBERING FORMAT)

W	S	K	2	5	1	2	5	L	0	0	0	F	T	A		

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSK2512	**L** = mΩ* **R** = Decimal **5L000** = 0.005 Ω **R0100** = 0.01 Ω * use "L" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TA** = Tin/lead, tape/reel (R86) **BA** = Tin/lead, bulk (B43)	(Dash Number) (up to 2 digits) From **1 - 99** as applicable

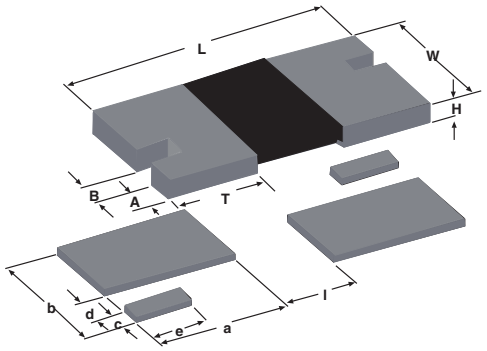
HISTORICAL PART NUMBERING: WSK2512 0.005 Ω 1 % R86 (WILL CONTINUE TO BE ACCEPTED)

WSK2512	0.005 Ω	1 %	R86
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

* Pb containing terminations are not RoHS compliant, exemptions may apply

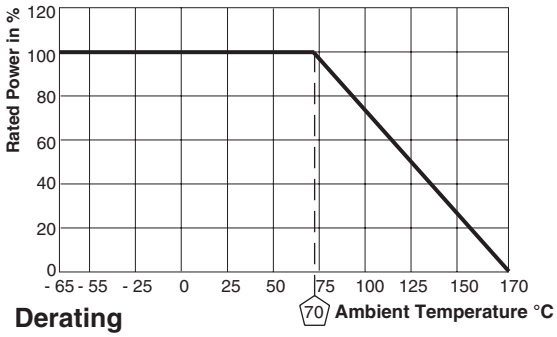
Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount, 4-Terminal

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]						
	RESISTANCE RANGE Ω	L	W	H	T	A	B
WSK2512	0.001 - 0.0049	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.087 ± 0.010 [2.21 ± 0.254]	0.030 ± 0.010 [0.762 ± 0.254]	0.020 ± 0.010 [0.508 ± 0.254]
	0.005 - 0.025	0.250 ± 0.010 [6.35 ± 0.254]	0.125 ± 0.010 [3.18 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.047 ± 0.010 [1.19 ± 0.254]	0.030 ± 0.010 [0.762 ± 0.254]	0.020 ± 0.010 [0.508 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]					
	a	b	c	d	e	l
WSK2512	0.125 [3.18]	0.130 [3.30]	0.030 [0.76]	0.020 [0.51]	0.055 [1.40]	0.065 [1.65]



Derating

PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202 Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

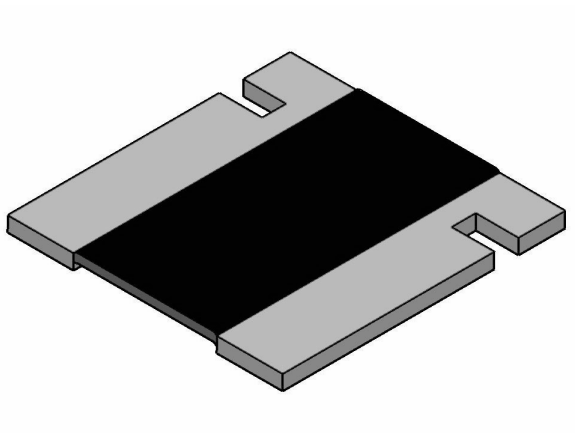
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	RIECES/REEL	CODE
WSK2512	12 mm/Embossed Plastic	178 mm/7"	2000	R86

Note

- Embossed carrier tape per EIA-481-1A

Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount, 4-Terminal



FEATURES

- 4-Terminal design allows for 0.5 % resistance tolerance down to 0.003 Ω
- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments and power amplifiers
- Proprietary processing technique produces extremely low resistance values (down to 0.001 Ω)
- All welded construction
- Solid metal Nickel-Chrome alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Low thermal EMF (< 3 µV/°C)
- Very low inductance, 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Lead (Pb)-free version is RoHS compliant

Pb-free Available

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE %	RESISTANCE RANGE Ω
WSL3637	3.0	0.5 and 1.0	0.001 - 0.01

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSL3637
Temperature Coefficient	ppm/°C	0.001 Ω - 0.0029 Ω = ± 75 0.003 Ω - 0.010 Ω = ± 50
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Weight/1000 pieces	g	274.3

GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSL36375L000FTA (PREFERRED PART NUMBERING FORMAT)

W	S	L	3	6	3	7	5	L	0	0	0	F	T	A		

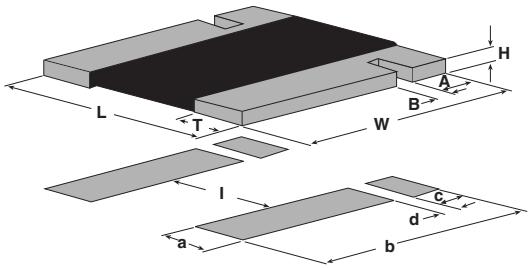
GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
WSL3637	**L** = mΩ* **R** = Decimal **5L000** = 0.005 Ω **R0100** = 0.01 Ω * use "L" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TA** = Tin/lead, tape/reel (R86) **BA** = Tin/lead, bulk (B43)	(Dash Number) (up to 2 digits) From **1 - 99** as applicable

HISTORICAL PART NUMBER EXAMPLE: WSL3637 0.005 Ω 1 % R86 (WILL CONTINUE TO BE ACCEPTED)

WSL3637	0.005 Ω	1 %	R86
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

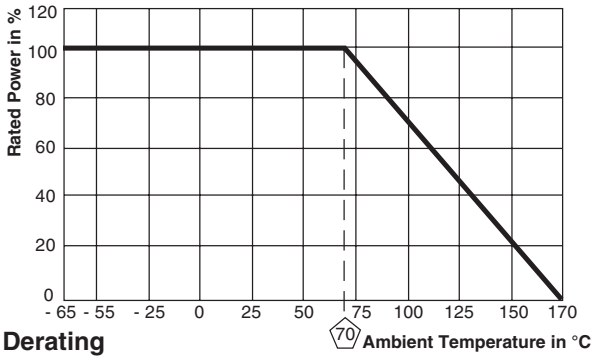
* Pb containing terminations are not RoHS compliant, exemptions may apply

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]						
	RESISTANCE RANGE Ω	W	L	H	T	A	B
WSL3637	0.002 - 0.01	0.370 ± 0.010 [9.40 ± 0.254]	0.360 ± 0.010 [9.14 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.086 ± 0.010 [2.18 ± 0.254]	0.061 ± 0.010 [1.55 ± 0.254]	0.032 ± 0.010 [0.813 ± 0.254]
	0.001 - 0.0019	0.370 ± 0.010 [9.40 ± 0.254]	0.360 ± 0.010 [9.14 ± 0.254]	0.025 ± 0.010 [0.635 ± 0.254]	0.138 ± 0.010 [3.51 ± 0.254]	0.061 ± 0.010 [1.55 ± 0.254]	0.032 ± 0.010 [0.813 ± 0.254]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]					
	RESISTANCE RANGE Ω	a	b	c	d	l
WSL3637	0.002 - 0.01	0.116 [2.95]	0.390 [9.91]	0.066 [1.68]	0.024 [0.610]	0.178 [4.52]
	0.001 - 0.0019	0.168 [4.27]	0.390 [9.91]	0.066 [1.66]	0.024 [0.610]	0.074 [1.88]



Derating

PERFORMANCE

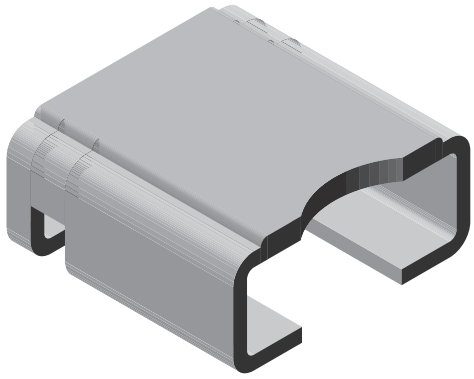
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x Rated Power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL3637	16 mm/Embossed Plastic	330 mm/13"	4000	EA

Note
- Embossed carrier tape per EIA-481-2

Power Metal Strip® Resistors, Low Value, High Power, Surface Mount



FEATURES

- High power to foot print size ratio
- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers and shunts
- Proprietary processing technique produces extremely low resistance values down to 0.0005 Ω
- All welded construction
- Solid metal Iron-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free
RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE %	RESISTANCE VALUE AVAILABLE mΩ	WEIGHT (Typical) g/1000 pieces
WSL2726	3.0	1.0	0.5, 2, 3, 5	420

Notes

- Power rating depends on the max. temp. at the solder point, component placement density and the substrate material
- Part Marking: Model, Value, Tolerance, Date Code

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSL RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 75 over temperature of + 20 °C to + 60 °C
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$

GLOBAL PART NUMBER INFORMATION

GLOBAL PART NUMBERING: WSL2726L5000FEA

W	S	L	2	7	2	6	L	5	0	0	0	F	E	A		

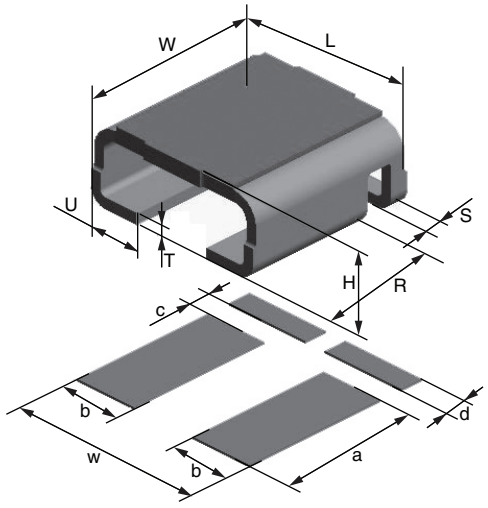
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSL2726	**L** = mΩ **L5000** = 0.0005 Ω **2L000** = 0.002 Ω **3L000** = 0.003 Ω **5L000** = 0.005 Ω	**F =** ± 1.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	(Dash number) (up to 2 digits) From **1 - 99** as applicable

For technical questions, contact: ww2bresistors@vishay.com
Document Number: 30131
Revision: 19-Oct-07

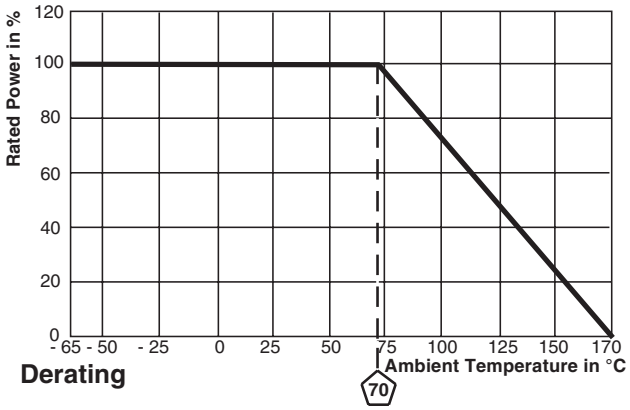
Power Metal Strip® Resistors, Low Value, High Power, Surface Mount

DIMENSIONS

MODEL	DIMENSIONS in inches [millimeters]						
	L	W	H	R	S	T	U
WSL2726	0.272 ± 0.008 [6.9 ± 0.2]	0.260 + 0.012/- 0.008 [6.6 + 0.3/- 0.2]	0.117 ± 0.008 [3.0 ± 0.2]	0.039 ± 0.004 [1.0 ± 0.1]	0.028 ± 0.004 [0.7 ± 0.1]	0.016 ± 0.002 [0.4 ± 0.05]	0.078 ± 0.004 [2.0 ± 0.1]



MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]				
	a	b	c	d	w
WSL2726	0.220 [5.6]	0.096 [2.44]	0.035 [0.89]	0.035 [0.89]	0.290 [7.4]



PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s for WSL2512 size and smaller	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Operation	- 65 °C for 45 min	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

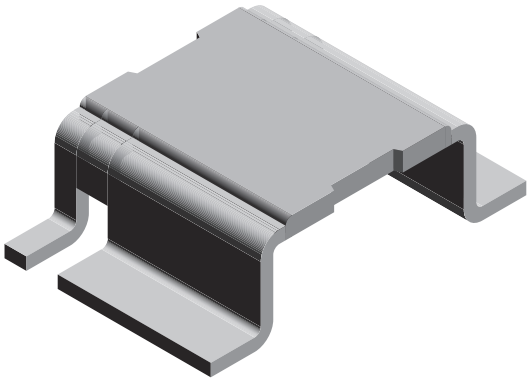
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL2726	16 mm/Embossed Plastic	330 mm/13"	1500	EA

Note

- Embossed Carrier Tape per EIA-481-2

Power Metal Strip® Resistors, Low Value, High Power, Surface Mount



FEATURES

- High power to foot print size ratio
- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers and shunts
- Proprietary processing technique produces extremely low resistance values down to 0.0005 Ω
- All welded construction
- Solid metal Iron-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free
RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE %	RESISTANCE VALUE AVAILABLE mΩ	WEIGHT (Typical) g/1000 pieces
WSL4026	3.0	1.0	0.5, 2, 3, 5	420

Notes
- Power rating depends on the max. temp. at the solder point, component placement density and the substrate material
- Part Marking: Model, Value, Tolerance, Date Code

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSL RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 75 over temperature of + 20 °C to + 60 °C
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$

GLOBAL PART NUMBER INFORMATION

GLOBAL PART NUMBERING: WSL4026L5000FEA

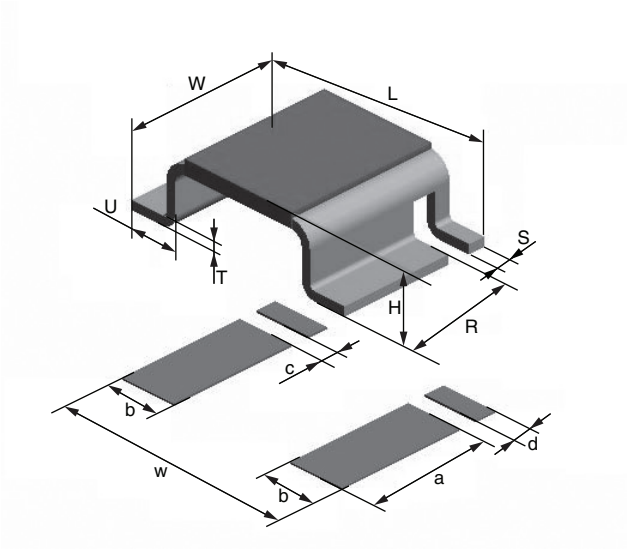
W	S	L	4	0	2	6	L	5	0	0	0	F	E	A		

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSL4026	**L** = mΩ **L5000** = 0.0005 Ω **2L000** = 0.002 Ω **3L000** = 0.003 Ω **5L000** = 0.005 Ω	**F =** ± 1.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	(Dash number) (up to 2 digits) From **1 - 99** as applicable

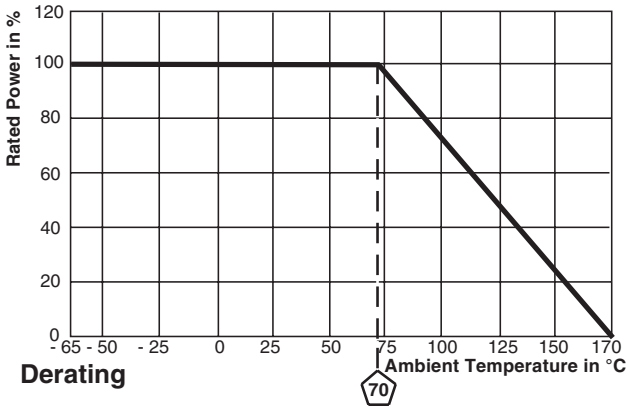
Power Metal Strip® Resistors, Low Value, High Power, Surface Mount

DIMENSIONS

MODEL	DIMENSIONS in inches [millimeters]						
	L	W	H	R	S	T	U
WSL4026	0.400 ± 0.008 [10.1 ± 0.2]	0.260 + 0.012/- 0.008 [6.6 + 0.3/- 0.2]	0.117 ± 0.008 [3.0 ± 0.2]	0.039 ± 0.004 [1.0 ± 0.1]	0.028 ± 0.004 [0.7 ± 0.1]	0.016 ± 0.002 [0.4 ± 0.05]	0.078 ± 0.004 [2.0 ± 0.1]



MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]				
	a	b	c	d	w
WSL4026	0.220 [5.6]	0.096 [2.44]	0.035 [0.89]	0.035 [0.89]	0.420 [10.6]



PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s for WSL2512 size and smaller	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Operation	- 65 °C for 45 min	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

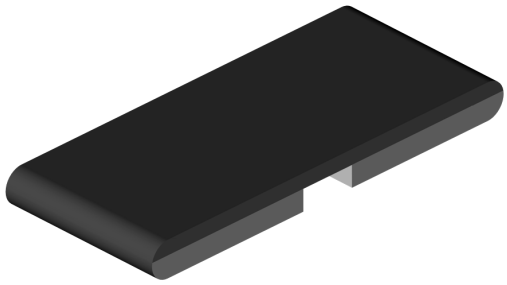
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL4026	16 mm/Embossed Plastic	330 mm/13"	1500	EA

Note

- Embossed Carrier Tape per EIA-481-2

Power Metal Strip® Resistors, High Power (5 W) Low Value (down to 0.001 Ω), Surface Mount



FEATURES

- Improved thermal management incorporated into design
- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers
- Proprietary processing technique produces extremely low resistance values
- All welded construction
- Solid metal Nickel-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Lead (Pb)-free construction
- Very low inductance (< 5 nH)
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free

e3

RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE %	RESISTANCE RANGE Ω
WSH2818	5 (1)	1.0	0.001 - 0.1

Note

(1) The WSH2818 is rated at 5 W with maximum surface temperature of 200 °C

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSH2818
Temperature Coefficient	ppm/°C	± 200 for 1 mΩ to 5.99 mΩ ± 75 for 6 mΩ to 100 mΩ
Inductance	ηH	< 5
Operating Temperature Range	°C	- 65 to + 170
Maximum Continuous Current	A	$(P/R)^{1/2}$
Weight/1000 pieces	g	126

GLOBAL PART NUMBER INFORMATION

GLOBAL PART NUMBERING: WSH2818R1000FEA

W	S	H	2	8	1	8	R	1	0	0	0	F	E	A		

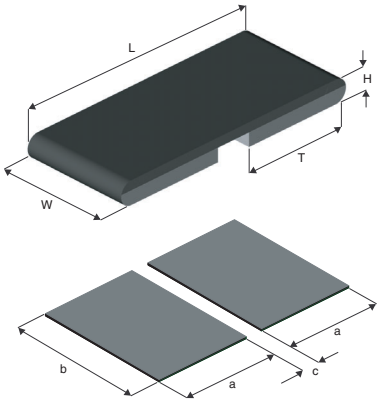
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSH2818	**L** = mΩ* **R** = Decimal **4L000** = 0.004 Ω **R0100** = 0.01 Ω * use "**L**" for resistance values < 0.01 Ω	**F =** ± 1.0 % **J =** ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk	(Dash number up to 2 digits) From **1 - 99** as applicable

For technical questions, contact: ww2bresistors@vishay.com

Document Number: 30120
Revision: 20-Apr-06

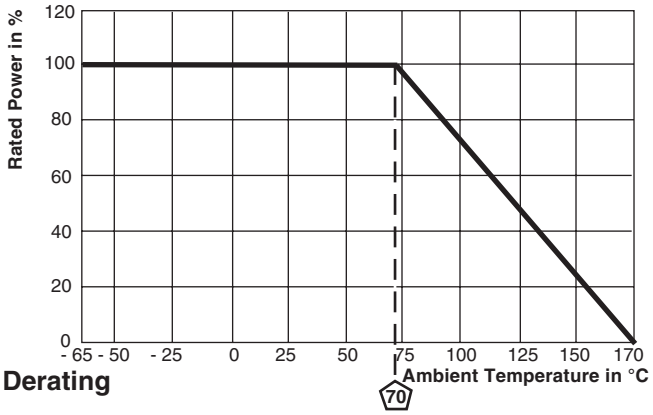
Power Metal Strip® Resistors, High Power (5 W)
Low Value (down to 0.001 Ω), Surface Mount

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]				
	RESISTANCE RANGE Ω	L	W	H	T
WSH2818	0.006 - 0.1	0.280 ± 0.010 [7.1 ± 0.25]	0.180 ± 0.010 [4.6 ± 0.25]	0.032 ± 0.010 [0.813 ± 0.25]	0.125 ± 0.010 [3.18 ± 0.25]
	0.001 - 0.0059	0.280 ± 0.010 [7.1 ± 0.25]	0.180 ± 0.010 [4.6 ± 0.25]	0.045 ± 0.010 [1.143 ± 0.25]	0.125 ± 0.010 [3.18 ± 0.25]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	a	b	C
WSH2818	0.138 [3.5]	0.200 [5.1]	0.024 [0.61]

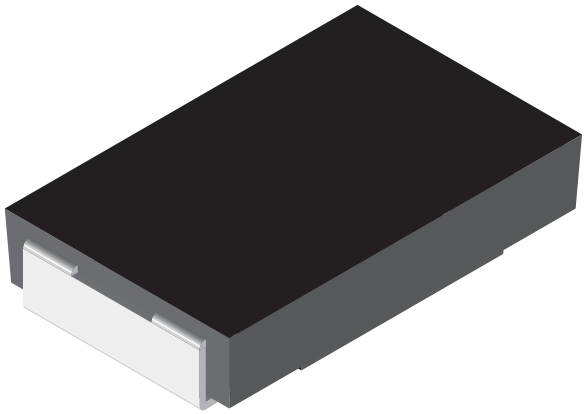


PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± 0.5 % Δ*R*
Short Time Overload	4 x rated power for 5 s	± 1.0 % Δ*R*
Low Temperature Operation	- 65 °C for 45 min	± 0.5 % Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± 1.0 % Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± 0.5 % Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± 0.5 % Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± 0.5 % Δ*R*
Load Life	1000 h at + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± 1.0 % Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± 0.5 % Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± 0.5 % Δ*R*

PACKAGING				
MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSH2818	16 mm/Embossed Plastic	330 mm/13"	3500	EA

Note
- Embossed carrier tape per EIA-481-2

Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount



FEATURES

- Molded high temperature encapsulation
- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers
- Proprietary processing technique produces extremely low resistance values (down to 0.001 Ω)
- All welded construction
- Solid metal Nickel-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)
- Lead (Pb)-free version is RoHS compliant

Pb-free Available

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE	POWER RATING $P_{70\,°C}$ W	RESISTANCE RANGE Ω	
			± 0.5 %	± 1.0 %
WSR2	4527	2.0	0.01 - 1.0	0.001 - 1.0
WSR3	4527	3.0 (1)	0.01 - 0.2	0.001 - 0.2

Note

(1) The WSR3 requires a minimum of 1050 sq. mil. circuit traces connecting to the recommended solder pad

- Part Marking: DALE, Model, Value, Tolerance, Date Code

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSR2 & WSR3
Temperature Coefficient	ppm/°C	0.005 Ω - 0.0099 Ω = ± 110 0.010 Ω - 1.0 Ω = ± 75
Dielectric Withstanding Voltage	V_{AC}	> 500
Insulation Resistance	Ω	> 10^9
Operating Temperature Range	°C	- 65 to + 275
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Weight/1000 pieces (typical)	g	440

GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSR25L000FTA (PREFERRED PART NUMBERING FORMAT)

W	S	R	2	5	L	0	0	0	F	T	A		

GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
WSR2 **WSR3**	**L** = mΩ* **R** = Decimal **5L000** = 0.005 Ω **R0100** = 0.01 Ω * use "**L**" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 % **J** = ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TA** = Tin/lead, tape/reel (R86) **BA** = Tin/Lead, bulk (B43)	(Dash Number) (up to 2 digits) From **1 - 99** as applicable

HISTORICAL PART NUMBER EXAMPLE: WSR2 0.005 Ω 1 % R86 (WILL CONTINUE TO BE ACCEPTED)

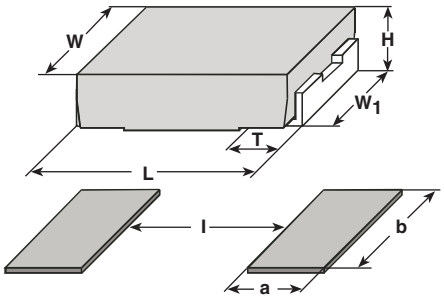
WSR2	0.005 Ω	1 %	R86
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

* Pb containing terminations are not RoHS compliant, exemptions may apply

For technical questions, contact: ww2bresistors@vishay.com

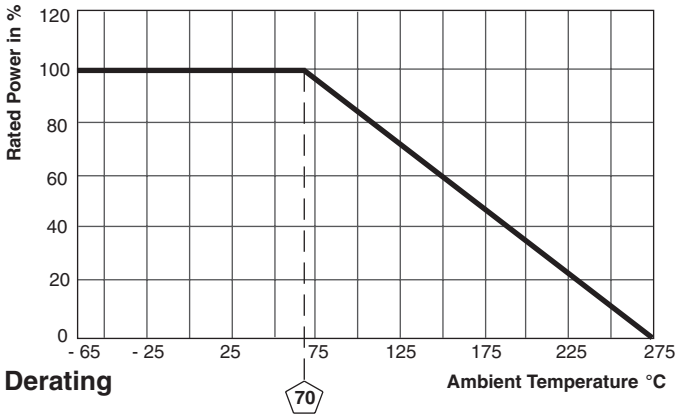
Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]				
	L	H	T	W	W_1
WSR2 WSR3	0.455 ± 0.032 [11.56 ± 0.813]	0.095 ± 0.005 [2.41 ± 0.127]	0.100 ± 0.010 [2.54 ± 0.254]	0.275 ± 0.005 [6.98 ± 0.127]	0.215 ± 0.005 [5.46 ± 0.127]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	a	b	l
WSR2 WSR3	0.155 [3.94]	0.230 [5.84]	0.205 [5.21]



PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS	
		WSR2	WSR3
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	WSR2: 5 x rated power for 5 s WSR3: 4 x rated power for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*	± (2.0 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 275 °C	± (1.0 % + 0.0005 Ω) Δ*R*	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (1.0 % + 0.0005 Ω) Δ*R*	± (2.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202 Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*	± (0.5 % + 0.0005 Ω) Δ*R*

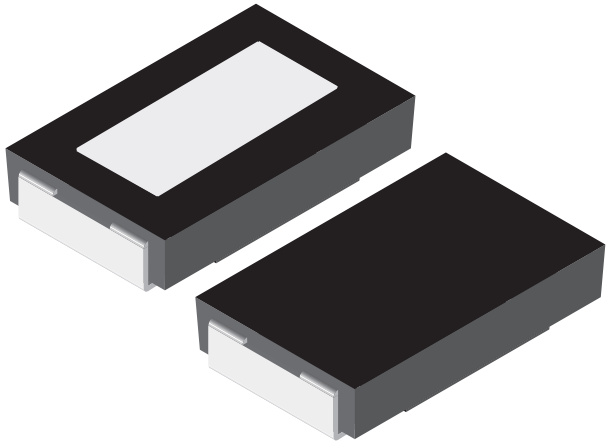
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSR2 and WSR3	24 mm/Embossed Plastic	330 mm/13"	1500	EA

Note

- Embossed Carrier Tape per EIA-481-2

Power Metal Strip® Resistors, High Power (5 W), Low Value (down to 0.001 Ω), Surface Mount



FEATURES

- Molded high temperature encapsulation
- Improved thermal management incorporated into design
- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instrumentation, power amplifiers
- Proprietary processing technique produces extremely low resistance values (down to 0.001 Ω)
- All welded construction
- Solid metal Nickel-Chrome or Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)
- Lead (Pb)-free version is RoHS compliant
- Integral heat sink not utilized for resistance values less than 0.0075 Ω

Pb-free Available

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE	POWER RATING $P_{70\,°C}$ W	RESISTANCE RANGE Ω	
			± 0.5 %	± 1 %
WSR5	4527	5.0 (1)	0.01 - 0.3	0.001 - 0.3

Note

(1) The WSR5 is rated at 5 W with terminal temperature maintained ≤ 120 °C

- Part Marking: DALE, Model, Value, Tolerance, Date Code

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSR5
Temperature Coefficient	ppm/°C	0.0075 Ω to 0.0099 Ω = ± 110 0.01 Ω to 0.3 Ω = ± 75
Dielectric Withstanding Voltage	V_{AC}	> 500
Insulation Resistance	Ω	> 10^9
Operating Temperature Range	°C	- 65 to + 275
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Weight/1000 pieces	g	476

GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSR5R0100FTA (PREFERRED PART NUMBERING FORMAT)

W	S	R	5	R	0	1	0	0	F	T	A		

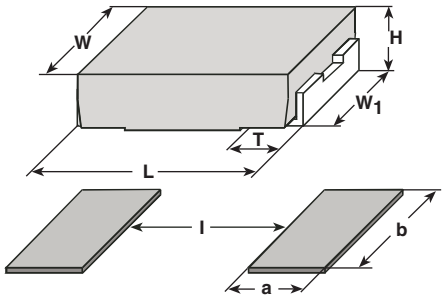
GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
WSR5	**L** = mΩ* **R** = Decimal **5L000** = 0.005 Ω **R0100** = 0.01 Ω * use "**L**" for resistance values < 0.01 Ω	**D** = ± 0.5 % **F** = ± 1.0 % **J** = ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TA** = Tin/lead, tape/reel (R86) **BA** = Tin/lead, bulk (B43)	(Dash Number) (up to 2 digits) From **1 - 99** as applicable

HISTORICAL PART NUMBER EXAMPLE: WSR5 0.01 Ω 1 % R86 (WILL CONTINUE TO BE ACCEPTED)

WSR5	0.01 Ω	1 %	R86
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

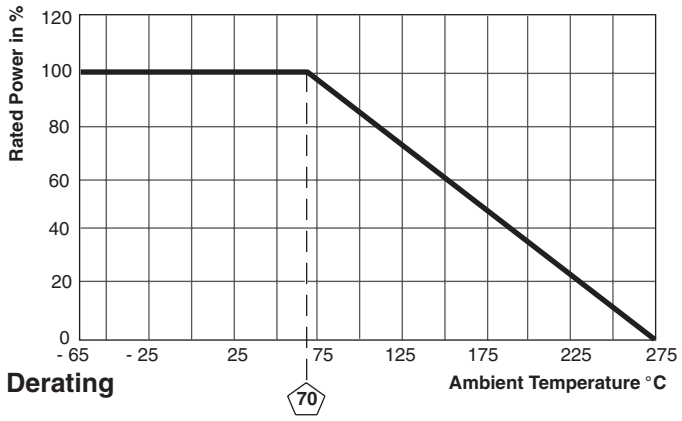
* Pb containing terminations are not RoHS compliant, exemptions may apply

DIMENSIONS



MODEL	DIMENSIONS in inches [millimeters]				
	L	H	T	W	W_1
WSR5	0.455 ± 0.032 [11.56 ± 0.813]	0.095 ± 0.005 [2.41 ± 0.127]	0.100 ± 0.010 [2.54 ± 0.254]	0.275 ± 0.005 [6.98 ± 0.127]	0.215 ± 0.005 [5.46 ± 0.127]

MODEL	SOLDER PAD DIMENSIONS in inches [millimeters]		
	a	b	l
WSR5	0.155 [3.94]	0.230 [5.84]	0.205 [5.21]



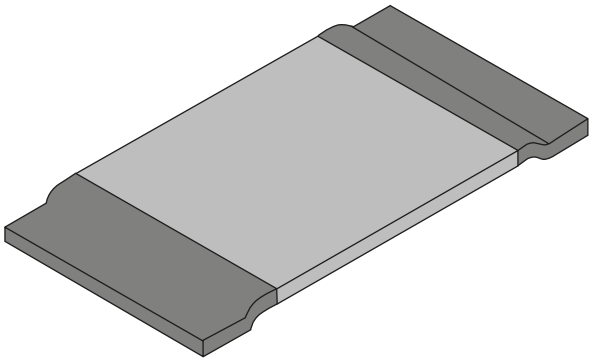
PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	3 x rated power for 5 s	± (2.0 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 275 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at 70 °C	± (2.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	260 ± 3 °C 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

PACKAGING				
MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSR5	24 mm/Embossed Plastic	330 mm/13"	1500	EA

Note

- Embossed Carrier Tape per EIA-481-2

Power Metal Strip® Resistors, Low Value, Surface Mount



FEATURES

- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments and power amplifiers
- Proprietary processing technique produces extremely low resistance values down to 0.002 Ω
- All welded construction
- Solid metal Manganese-Copper alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Low Thermal EMF (< 3 μV/°C)
- Very low inductance 0.5 ηH to 5 ηH
- Excellent frequency response to 50 MHz

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE %	RESISTANCE RANGE Ω
WSR2-3	3.0	1.0	0.002 to 0.005

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSR2-3
Temperature Coefficient	ppm/°C	± 175
Inductance	ηH	< 3
Operating Temperature Range	°C	- 65 to + 170
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Weight/1000 pieces	g	169

GLOBAL PART NUMBER INFORMATION

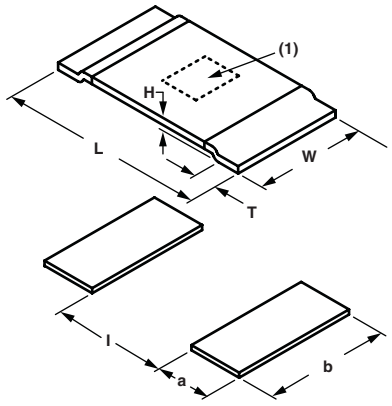
GLOBAL PART NUMBERING: WSR23L000FEA3

W	S	R	2	3	L	0	0	0	F	E	A	3

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSR2	**L** = mΩ **2L000** = 0.002 Ω **5L000** = 0.005 Ω	**D =** ± 0.5 % **F =** ± 1.0 % **J =** ± 5.0 %	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TA** = Tin/lead, tape/reel (R86) **BA** = Tin/lead bulk (B43)	3 for special design with no mold compound

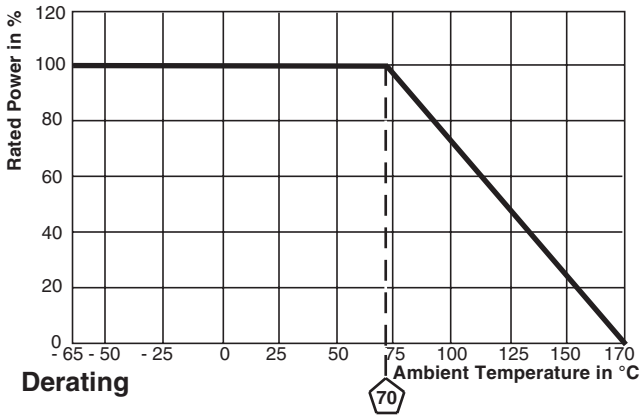
For technical questions, contact: ww2bresistors@vishay.com
Document Number: 30133
Revision: 19-Oct-07

DIMENSIONS in inches [millimeters]



MODEL	DIMENSIONS				SOLDER PAD DIMENSIONS		
	L	W	H	T	a	b	l
WSR2-3	0.400 ± 0.010 [10.16 ± 0.254]	0.215 ± 0.010 [5.46 + 0.254]	0.029 ± 0.005 [0.737 ± 0.127]	0.075 ± 0.010 [1.91 ± 0.254]	0.100 [2.540]	0.235 [5.969]	0.240 [5.080]

Note
(1) 0.1" x 0.1" area in the center of the resistor will be flat and free of any trim cuts to facilitate pick & place nozzle.

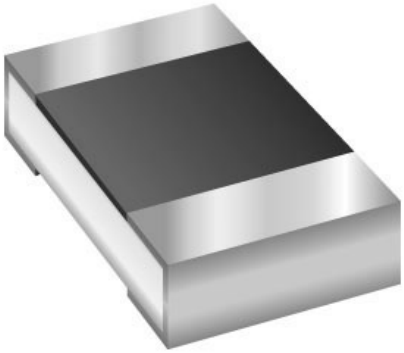


PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± (0.5 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s for WSL2512 size and smaller	± (1.0 % + 0.0005 Ω) Δ*R*
Low Temperature Operation	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± (1.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± (0.5 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± (0.5 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min 3 directions, 12 h	± (0.5 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (2.0 % + 0.0005 Ω) Δ*R*

PACKAGING				
MODEL	**REEL**			
	TAPE WIDTH	**DIAMETER**	**PIECES/REEL**	**CODE**
WSR2-3	24 mm/Embossed Plastic	330 mm/13"	5000	EA

Note
- Embossed Carrier Tape per EIA-481-2

Power Metal Strip® Resistors (Extended Range) Surface Mount



FEATURES

- 0805 size resistors with 0.25 W power rating
- Smaller footprint than a 1206 resistor (uses 40 % less board space)
- Superior overload and pulse handling capability
- SMD alternative for low power leaded wirewound resistors
- Low TCR 15 ppm/°C
- Low noise: < - 40 dB
- Voltage Coefficient: < 0.00001 %/V (< 0.1 ppm/V)
- Very low inductance: < 0.08 µH

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	POWER RATING $P_{70\,°C}$ W	LIMITING ELEMENT VOLTAGE V	TEMPERATURE COEFFICIENT ppm/K	RESISTANCE RANGE Ω	E-SERIES
					± 0.1 %, ± 0.25 %, ± 0.5 %, ± 1 %	
WSE0805	0805	0.25	$(P \times R)^{1/2}$	15, 25	10 - 10K	96

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSE0805
Dielectric Withstanding Voltage	V_{AC}	200
Insulation Resistance	Ω	> 10^9
Operating Temperature Range	°C	- 65 to + 150
Weight/1000 pieces	g	5.5

GLOBAL PART NUMBER INFORMATION

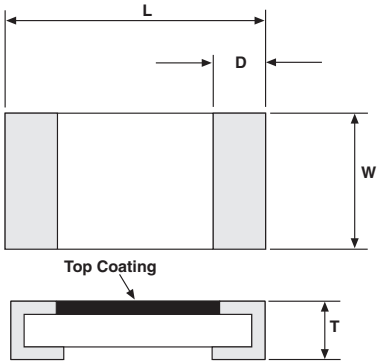
GLOBAL PART NUMBERING: WSE08051K500FXEA

W	S	E	0	8	0	5	1	K	5	0	0	F	X	E	A		

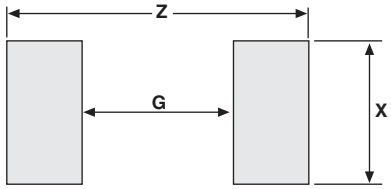
GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	TCR CODE	PACKAGING CODE	SPECIAL
WSE0805	**R** = Decimal **K** = Thousand **100R0** = 100 Ω **4K000** = 4 kΩ	**B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 %	**X** = ± 15 ppm/°C **E** = ± 25 ppm/°C	**EA** = Lead (Pb)-free, tape/reel **EK** = Lead (Pb)-free, bulk **TG** = Tin/Lead, tape/reel (RT1) **BA** = Tin/Lead, bulk (B43)	(Dash Number) (up to 2 digits) from **1 - 99** as applicable

For technical questions, contact: ww2bresistors@vishay.com

DIMENSIONS



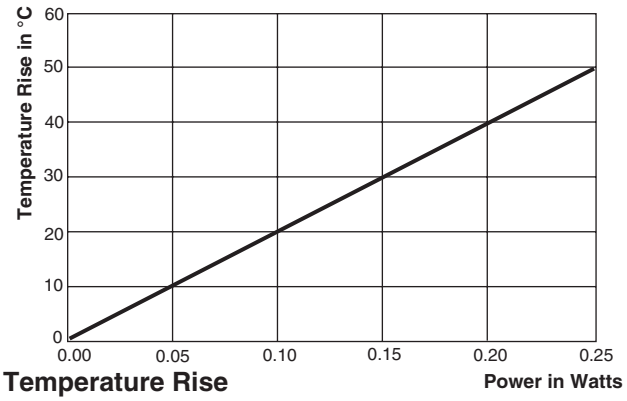
RECOMMENDED LAND PATTERN



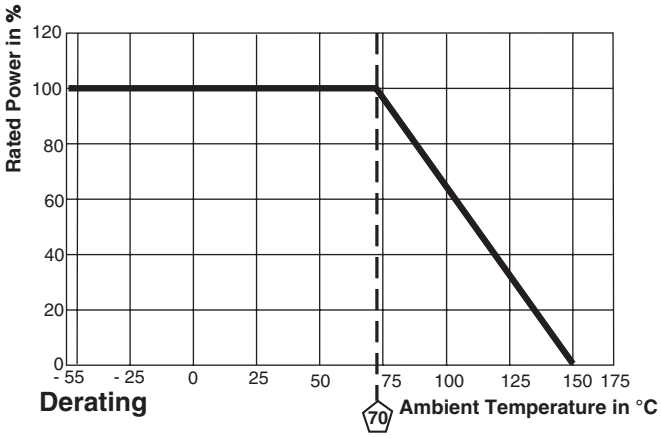
MODEL	DIMENSIONS in inches [millimeters]						
	D	L	W	T	G (1)	X (1)	Z (1)
WSE0805	0.015 ± 0.005 [0.38 ± 0.13]	0.080 ± 0.005 [2.30 ± 0.13]	0.050 ± 0.005 [1.27 ± 0.13]	0.025 max [0.64 max]	0.028 ± 0.004 [0.70 ± 0.10]	0.050 ± 0.004 [1.27 ± 0.10]	0.122 ± 0.004 [3.103 ± 0.10]

Note

(1) Land pattern dimensions (G, X, Z) are per IPC-782A



Temperature Rise



Derating

PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 65 °C to + 150 °C, 100 cycles, 15 min at each extreme	± 0.10 % Δ*R*
Short Time Overload	5 x rated power for 5 s	± 0.10 % Δ*R*
Low Temperature Operation	- 65 °C, 0.25 W for 45 min	± 0.05 % Δ*R*
High Temperature Exposure	100 h at + 150 °C	± 0.10 % Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± 0.10 % Δ*R*
Load Life	1000 h at 70 °C, 1.5 h “ON”, 0.5 h “OFF”	± 0.05 % Δ*R*
Resistance to Bonding Exposure	260 °C for 10 s	± 0.10 % Δ*R*

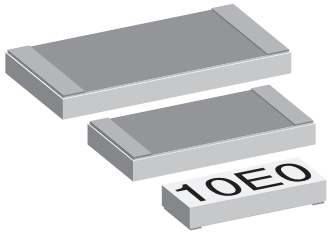
PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSE0805	8 mm/Punched Paper	178 mm/7"	5000	EA

Note

- Embossed Carrier Tape per EIA-481-1A

Power Metal Strip® Flip Chip (Extended Range)
Patents Pending



FEATURES

- SMD alternative for low power leaded wirewound resistors
- Excellent stability in different environmental conditions (< 0.5 % change in resistance)
- Superior overload and pulse handling capability as compared to thin film (as much as 2 x better)
- Low TCR, down to ± 15 ppm/K
- Low noise: < 0.01 $\mu V_{rms}/V$
- Voltage coefficient: < 0.00001 %/V (< 0.1 ppm/V)
- Very low inductance: < 0.08 µH

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE INCH	POWER RATING $P_{70\ °C}$	LIMITING ELEMENT VOLTAGE MAX (1) V≅	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE (2) Ω	E-SERIES
WSL1506E	1506	0.25	63	15, 25	0.5, 1	0R5 - 10K	96
WSL2010E	2010	0.5	100	15, 25	0.5, 1	0R5 - 10K	96
WSL2512E	2512	1.0	100	15, 25	0.5, 1	0R5 - 10K	96

Notes
- **Ask about further value ranges, tighter tolerances and TCR's**
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- 4-Digit Marking, according to MIL-PRF-55342 (except as noted in Ordering Information table), on top side

(1) Rated voltage: $\sqrt{P \times R}$
(2) Contact factory using e-mail address at bottom of this page for resistance values available between 0R5 - 10R for 1506 and 0R5 - 100R for 2010 and 2512

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	WSL1506E	WSL2010E	WSL2512E
Rated Dissipation at 70 °C	W	0.25	0.5	1.0
Limiting Element Voltage (3)	V ≅	63	100	100
Insulation Voltage (1 min)	Vdc/ac peak	200	200	200
Thermal Resistance	K/W	≤ 220 (4)	≤ 88 (4)	≤ 65 (4)
Insulation Resistance	MΩ	$> 10^6$		
Category Temperature Range	°C	- 55 to + 150		
Weight/1000 pieces	g	12	25	35

Notes
(3) Rated voltage: $\sqrt{P \times R}$
(4) Depending on solder pad dimensions

PACKAGING

MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL1506E	12 mm/Embossed Plastic	180 mm/7"	4000	EA
WSL2010E	12 mm/Embossed Plastic	180 mm/7"	4000	EA
WSL2512E	12 mm/Embossed Plastic	180 mm/7"	2000	EA

Note
- Embossed Carrier Tape per EIA-481-1.2

GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBERING: WSL1506E10E0XEA

W	S	L	1	5	0	6	E	1	0	E	0	X	E	A		

GLOBAL MODEL
WSL1506E

RESISTANCE VALUE & TOLERANCE

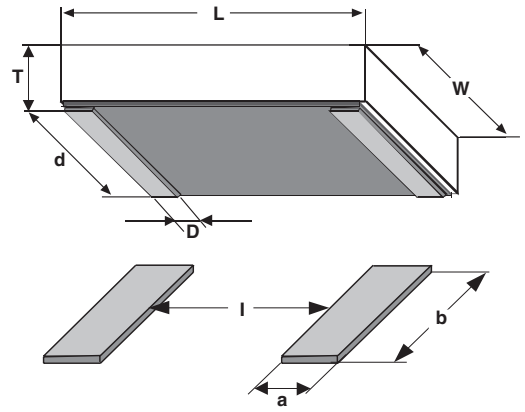
Resistance Tolerance (±)	Multiplier	Symbol
0.5	X1	W
0.5	X1000	X
0.5	X1 000 000	Y
1.0	X1	D
1.0	X1000	E
1.0	X1 000 000	F

TOLERANCE CODE
E = ± 25 ppm/K
X = ± 15 ppm/K

PACKAGING
EA = Lead (Pb)-free, tape/reel
EK = Lead (Pb)-free, bulk
TA = Tape/reel (R86)
BA = Bulk (B43)

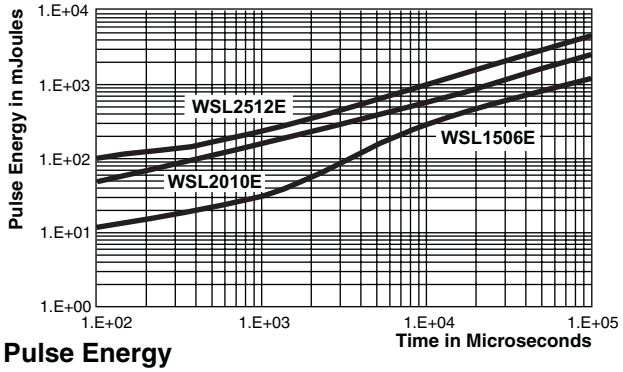
SPECIAL
(Dash Number)
(up to 2 digits)
From **1 - 99** as applicable

DIMENSIONS



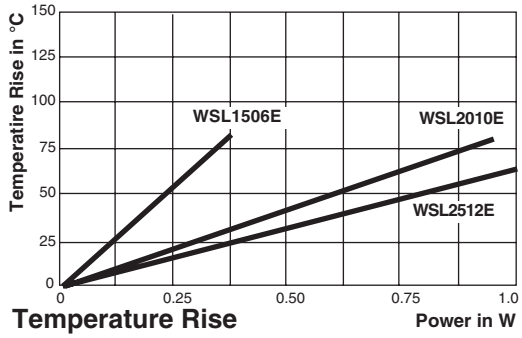
SIZE INCH	Dimensions in inches [millimeters]				
	L	W	T_{max}	D	d
1506	0.15 ± 0.005 [3.81 ± 0.13]	0.062 ± 0.003 [1.57 ± 0.08]	0.025 [0.64]	0.012 ± 0.003 [0.30 ± 0.08]	0.059 ± 0.003 [1.50 ± 0.08]
2010	0.200 ± 0.005 [5.08 ± 0.13]	0.100 ± 0.003 [2.54 ± 0.08]	0.025 [0.64]	0.020 ± 0.003 [0.51 ± 0.08]	0.097 ± 0.003 [2.46 ± 0.08]
2512	0.250 ± 0.005 [6.35 ± 0.13]	0.126 ± 0.003 [3.20 ± 0.08]	0.025 [0.64]	0.024 ± 0.003 [0.61 ± 0.08]	0.123 ± 0.003 [3.12 ± 0.08]

SIZE INCH	Solder Pad Dimensions in inches [millimeters]		
	a	b	l
1506	0.015 [0.38]	0.062 [1.57]	0.118 [3.00]
2010	0.023 [0.58]	0.100 [2.54]	0.153 [3.89]
2512	0.027 [0.69]	0.126 [3.20]	0.196 [4.98]

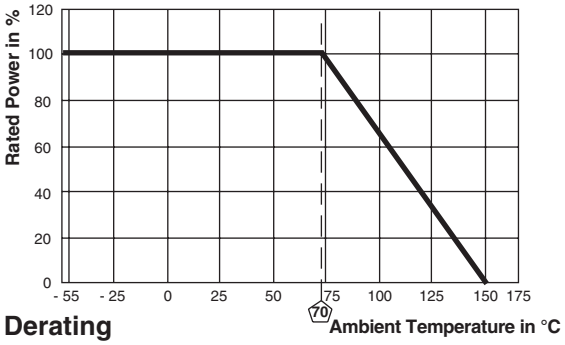


Pulse Energy

Pulse Energy Plot:
This represents the energy in each of 50 pulses, with a 1 second rest between pulses, that it takes to shift the WSL....E resistance ± (0.50 % + 0.01 Ω).



Temperature Rise



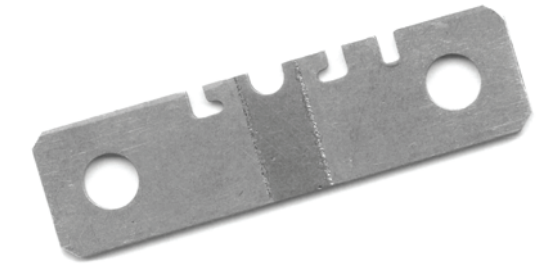
Derating

PERFORMANCE

TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	- 55 °C to + 150 °C, 100 cycles, 15 min at each extreme	± (0.20 % + 0.01 Ω)
Short Time Overload	5 x rated power for 5 s	± (0.20 % + 0.01 Ω)
Low Temperature Storage	- 65 °C for 24 h	± (0.20 % + 0.01 Ω)
High Temperature Exposure	1000 h at + 150 °C	± (0.50 % + 0.01 Ω)
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7a and 7b not required	± (0.50 % + 0.01 Ω)
Load Life	1000 h at rated power, + 70 °C, 1.5 h “ON”, 0.5 h “OFF”	± (0.50 % + 0.01 Ω)
Vibration	MIL-STD-202, Method 204D	± (0.10 % + 0.01 Ω)
Mechanical Shock	100 g’s for 6 ms, 5 pulses	± (0.10 % + 0.01 Ω)
Resistance to Soldering Heat	+ 260 °C Solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.50 % + 0.01 Ω)

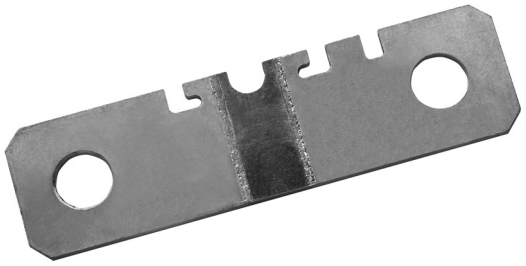
Power Metal Strip® Resistors

Special



Contents

Power Metal Strip® Meter Shunt Resistor, Very Low Value (down to 0.00016 Ω)



FEATURES

- High power to resistor size ratio
- 4-Terminal (Kelvin) connection design
- Proprietary processing technique produces extremely low resistance values
- All welded construction
- RoHS compliant, lead (Pb)-free construction
- Very low inductance (< 0.5 nH)
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE %	RESISTANCE VALUE AVAILABLE µΩ	WEIGHT (Typical) g
WSMS5515	3.0	5.0	160, 200, 250, 300, 500	7.8

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	160 µΩ, 200 µΩ and 250 µΩ = ± 225 300 µΩ and 500 µΩ = ± 175
Operating Temperature Range	°C	- 65 to + 170
Maximum Current Rating	A	$(P/R)^{1/2}$

GLOBAL PART NUMBER INFORMATION

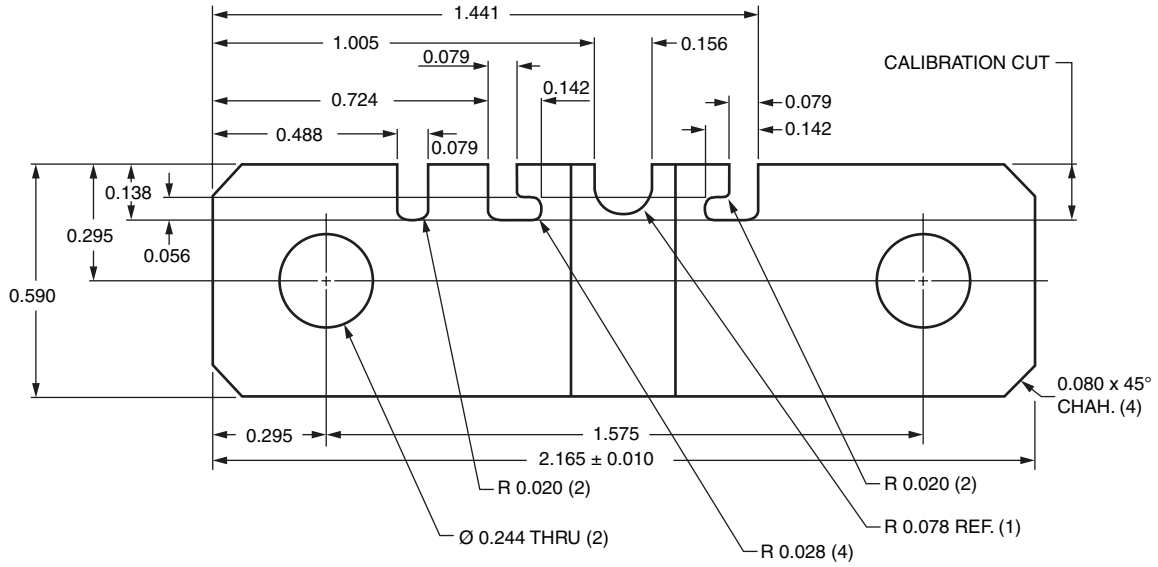
GLOBAL PART NUMBERING: WSMS5515L2500JK (WSMS5515, 0.00025 Ω, ± 5 %)

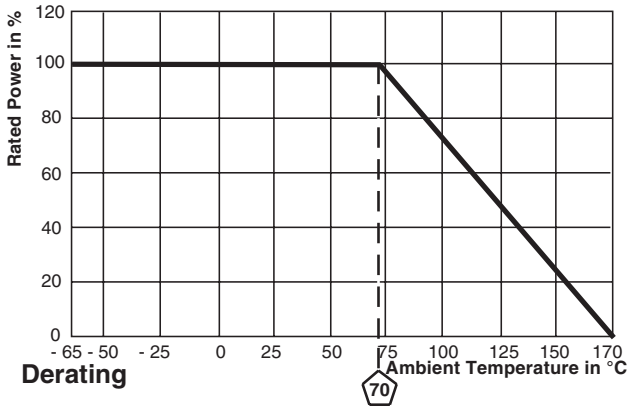
W	S	M	S	5	5	1	5	L	2	5	0	0	J	K		

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSMS5515	**L** = mΩ **L1600** = 0.00016 Ω **L2000** = 0.00020 Ω **L2500** = 0.00025 Ω **L3000** = 0.00030 Ω **L5000** = 0.00050 Ω	**J** = ± 5.0 %	**K** = Bulk pack	(Dash number) (up to 2 digits) From **1 - 99** as applicable

Power Metal Strip® Meter Shunt Resistor, Very Low Value (down to 0.00016 Ω)

DIMENSIONS in inches





TOLERANCES ON DECIMALS
XXX ± 0.005

RESISTANCE VALUE (μΩ)	RESISTOR THICKNESS (inches)	ELEMENT MATERIAL
160	0.051	Mn-Cu
200	0.051	Mn-Cu
250	0.033	Mn-Cu
300	0.033	Mn-Cu
500	0.059	Fe-Cr

PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± 0.5 % Δ*R*
Short Time Overload	5 x rated power for 5 s	± 0.5 % Δ*R*
Low Temperature Operation	- 65 °C for 45 min	± 0.5 % Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± 1.0 % Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± 0.5 % Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± 0.5 % Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± 0.5 % Δ*R*
Load Life	1000 h at + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± 1.0 % Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± 0.5 % Δ*R*

Power Metal Strip® Battery Shunt Resistor, Very Low Value (100 µΩ and 125 µΩ)

FEATURES

- High power to resistor size ratio
- Proprietary processing technique produces extremely low resistance values
- All welded construction
- RoHS compliant, lead (Pb)-free construction
- Very low inductance (< 5 nH)
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 µV/°C)

Pb-free
RoHS COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70\ °C}$ W	TOLERANCE %	RESISTANCE VALUE µΩ	WEIGHT (Typical) g
WSBS8518	36	5.0	100, 125	46.3

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 225
Operating Temperature Range	°C	- 65 to + 170
Maximum Current Rating	A	$(P/R)^{1/2}$

GLOBAL PART NUMBER INFORMATION

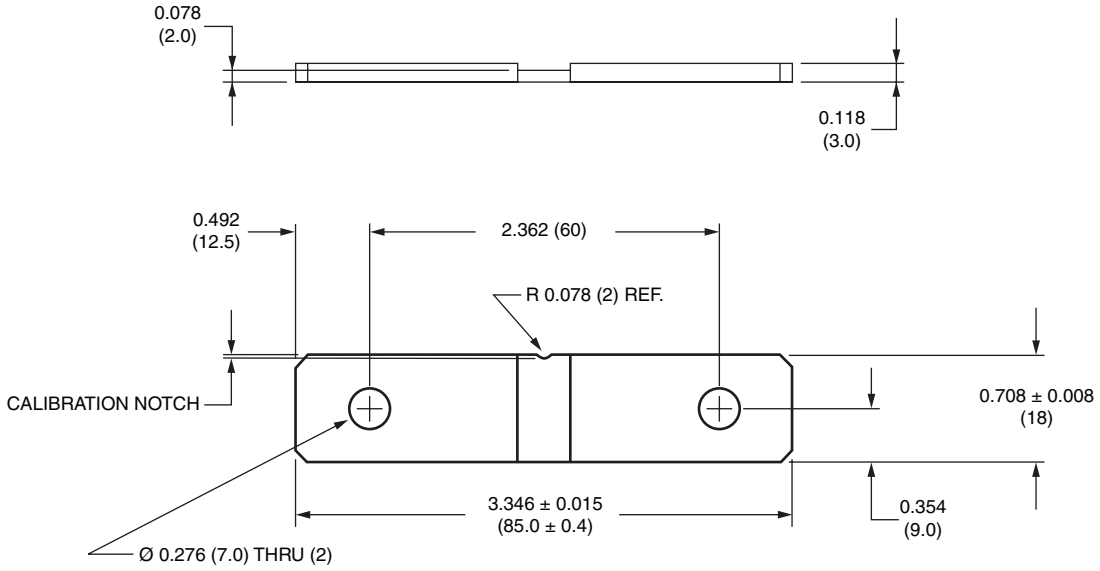
GLOBAL PART NUMBERING: WSBS8518L1250JK (WSBS8518, 0.000125 Ω, ± 5 %)

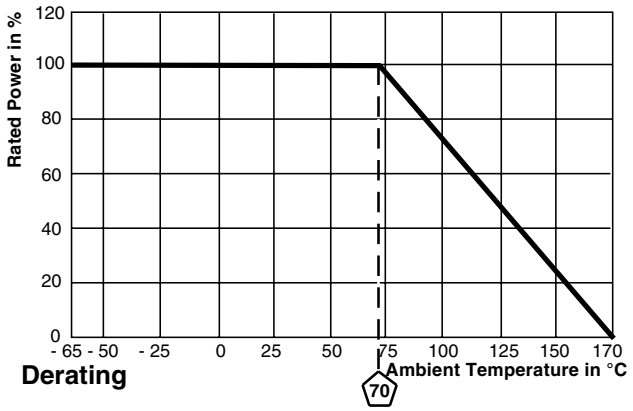
W	S	B	S	8	5	1	8	L	1	2	5	0	J	K		

GLOBAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING CODE	SPECIAL
WSBS8518	**L** = mΩ **L1000** = 0.000100 Ω **L1250** = 0.000125 Ω	**J** = ± 5.0 %	**K** = Bulk pack	(Dash number) (up to 2 digits) From **1 - 99** as applicable

Power Metal Strip® Battery Shunt Resistor, Very Low Value (100 μΩ and 125 μΩ)

DIMENSIONS in inches (millimeters)





TOLERANCES ON DECIMALS
XXX ± 0.005

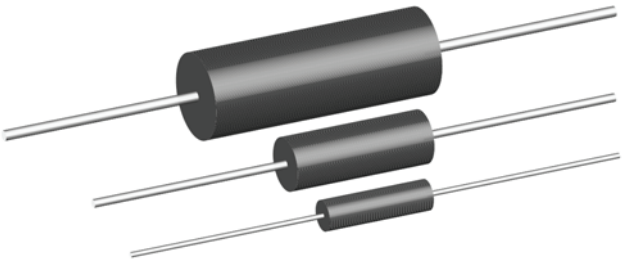
UNLESS OTHER WISE LISTED

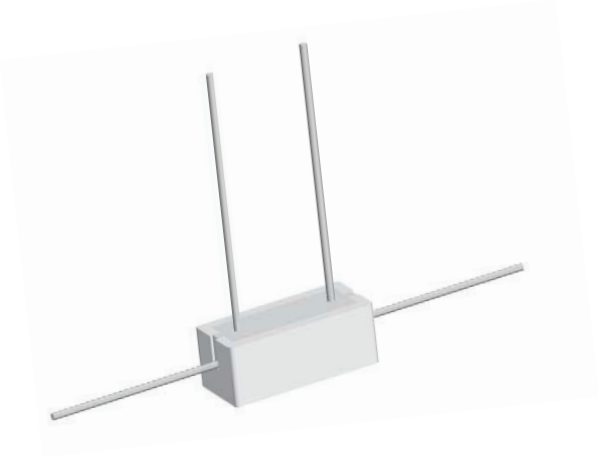
RESISTANCE VALUE (μΩ)	ELEMENT MATERIAL
100	Mn-Cu
125	Mn-Cu

PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal Shock	- 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme	± 0.5 % Δ*R*
Short Time Overload	5 x rated power for 5 s	± 0.5 % Δ*R*
Low Temperature Operation	- 65 °C for 45 min	± 0.5 % Δ*R*
High Temperature Exposure	1000 h at + 170 °C	± 1.0 % Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % Bias, 1000 h	± 0.5 % Δ*R*
Mechanical Shock	100 g's for 6 ms, 5 pulses	± 0.5 % Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± 0.5 % Δ*R*
Load Life	1000 h at + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± 1.0 % Δ*R*
Moisture Resistance	MIL-STD-202, Method 106, 0 % power, 7b not required	± 0.5 % Δ*R*

Power Metal Strip® Resistors

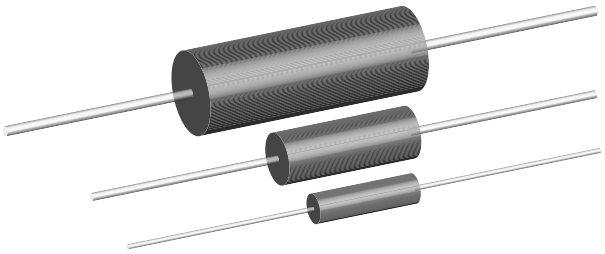
Leaded





Contents

Wirewound Resistors, Precision Power, Low Value, Commercial, Military, MIL-PRF-49465 Type RLV, Axial Lead



FEATURES

- Ideal for all types of current sensing applications including switching and linear power supplies, instruments and power amplifiers
- Proprietary processing technique produces extremely low resistance values
- Excellent load life stability
- Low temperature coefficient
- Low inductance
- Cooler operation for high power to size ratio

Pb-free Available

e3

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	HISTORICAL MODEL	MIL-PRF-49465 TYPE	POWER RATING $P_{25\ °C}$ W	RESISTANCE RANGE Ω (1) ± 1 %, ± 3 %, ± 5 %, ± 10 %	TECHNOLOGY
LVR01	LVR-1	-	1	0.01 - 0.1 (2)	Metal Strip
LVR03	LVR-3	-	3	0.005 - 0.2	Metal Strip
LVR03...26	**LVR-3-26**	**RLV30 (M4946506)**	**3**	**0.01 - 0.2**	**Metal Strip**
LVR05	LVR-5	-	5	0.005 - 0.3	Metal Strip
LVR05...26	**LVR-5-26**	**RLV30 (M4946507)**	**5**	**0.01 - 0.3**	**Metal Strip**
LVR10	LVR-10	-	10	0.01 - 0.8	Coil Spacewound

Notes

(1) Resistance is measured 3/8" [9.52 mm] from the body of the resistor, or at 1.183" [30.05 mm], 1.315" [33.40 mm], 1.675" [42.545 mm] or 2.575" [65.405 mm] spacing for the LVR01, LVR03, LVR05 and LVR10 respectively.

(2) Standard resistance values are 0.01 Ω, 0.015 Ω, 0.02 Ω, 0.025 Ω, 0.03 Ω, 0.033 Ω, 0.04 Ω, 0.05 Ω, 0.051 Ω, 0.06 Ω, 0.068 Ω, 0.07 Ω, 0.08 Ω, 0.09 Ω and 0.1 Ω with 1 % tolerance. Other resistance values may be available upon request.

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	LVR01	LVR03	LVR05	LVR10
Rated Power at + 25 °C	W	1	3	5	10
Operating Temperature Range	°C	- 65/+ 175	- 65/+ 275		
Dielectric Withstanding Voltage	V_{AC}	1000	1000	1000	1000
Insulation Resistance	Ω	10 000 MΩ minimum dry			
Short Time Overload	-	5 x rated power for 5 s			10 x rated power for 5 s
Terminal Strength (minimum)	lb	5	10	10	10
Temperature Coefficient	ppm/°C	See TCR vs Resistance Value Chart			
Maximum Working Voltage	V	$(P \times R)^{1/2}$			
Weight (maximum)	g	2	2	5	11

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: LVR055L000FS73 (preferred part number format)

L	V	R	0	5	5	L	0	0	0	F	S	7	3			

GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
LVR01 **LVR03** **LVR05** **LVR10**	**R** = Decimal **L** = mΩ (values < 0.010 Ω) **R1500** = 0.15 Ω **7L000** = 0.007 Ω	**D** = ± 0.5 % **F** = ± 1.0 % **G** = ± 2.0 % **H** = ± 3.0 % **J** = ± 5.0 % **K** = ± 10.0 %	**E12** = Lead (Pb)-free bulk **E03** = Lead (Pb)-free lacer pack (LVR10) **E70** = Lead (Pb)-free, tape/reel 1000 pieces (LVR01, 03) **E73** = Lead (Pb)-free, tape/reel 500 pieces **B12** = Tin/lead bulk **L03** = Tin/lead lacer pack (LVR10) **S70** = Tin/lead, tape/reel 1000 pieces (LVR01, 03) **S73** = Tin/lead, tape/reel 500 pieces	(Dash Number) (up to 3 digits) From **1 - 999** as applicable

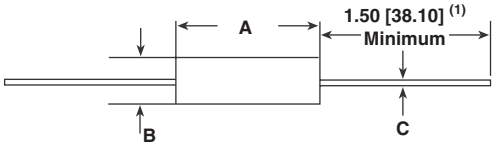
Historical Part Number example: LVR-5 0.005 Ω 1 % S73 (will continue to be accepted for tin/lead product only)

LVR-5	0.005 Ω	1 %	S73
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

* Pb containing terminations are not RoHS compliant, exemptions may apply

Wirewound Resistors, Precision Power, Low Value, Commercial, Military, MIL-PRF-49465 Type RLV, Axial Lead

DIMENSIONS in inches [millimeters]



MODEL	DIMENSIONS in inches [millimeters]		
	A ± 0.010 [0.254]	B ± 0.010 [0.254]	C ± 0.002 [0.051]
LVR01	0.427 [10.85]	0.115 [2.92]	0.020 [0.508]
LVR03	0.560 [14.22]	0.205 [5.21]	0.032 [0.813]
LVR05	0.925 [23.50]	0.330 [8.38]	0.040 [1.02]
LVR10	1.828 [46.43]	0.392 [9.96]	0.040 [1.02]

Note
(1) On some standard reel pack methods, the leads may be trimmed to a shorter length than shown.

MATERIAL SPECIFICATIONS

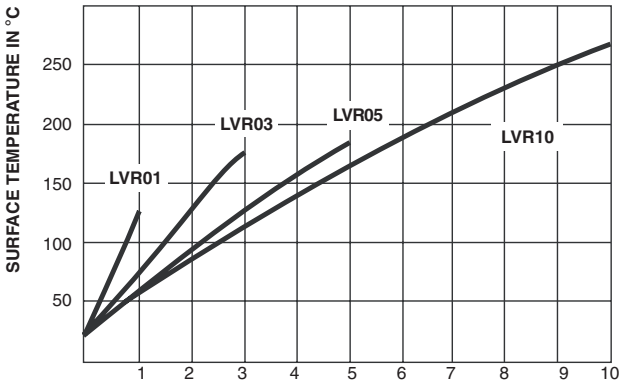
Element: Self-supporting nickel-chrome alloy (LVR10 also utilizes manganin)

Encapsulation: High temperature mold compound

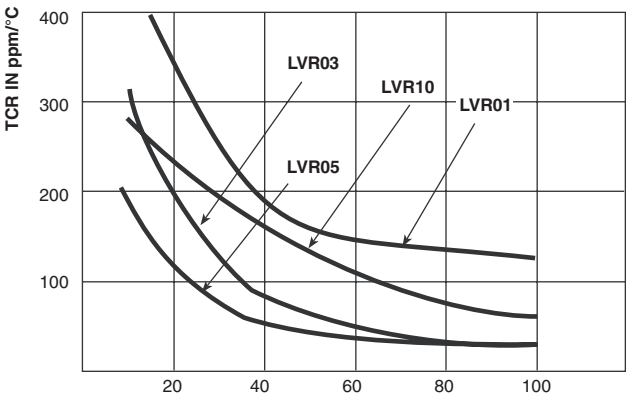
Terminals: Tinned copper

Part Marking: DALE, model, wattage, value, tolerance, date code

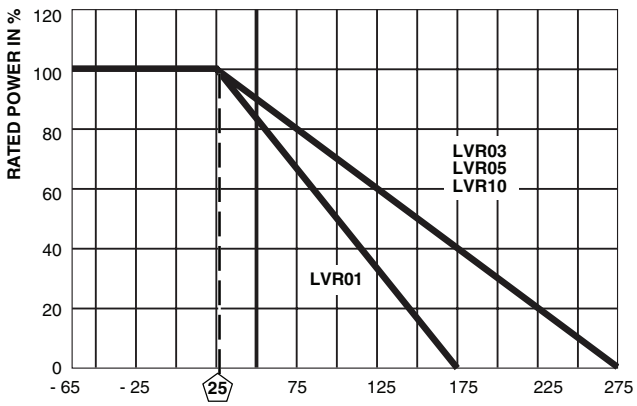
The improved TCR characteristics of these LVR models from - 55 °C to + 125 °C (reference to + 25 °C) are as follows:



Surface Temperature vs Power



TCR vs Resistance Value



Derating

PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal Shock	- 65 °C to + 125 °C, 5 cycles, 15 min at each extrem	± (0.2 % + 0.0005 Ω) Δ*R*
Short Time Overload	5 x rated power (LVR01, 03, 05), 10 x rated power (LVR10) for 5 s	± (0.5 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 24 h	± (0.2 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	250 h at + 275 °C (+ 175 °C for LVR01)	± (2.0 % + 0.0005 Ω) Δ*R*
Dielectric Withstanding Voltage	1000 V_{rms}, 1 min	± (0.1 % + 0.0005 Ω) Δ*R*
Insulation Resistance	MIL-STD-202 Method 302, 100 V	1000 MΩ minimum
Moisture Resistance	MIL-STD-202 Method 106, 100 7b not applicable	± (0.2 % + 0.0005 Ω) Δ*R*
Shock, Specified Pulse	MIL-STD-202 Method 213, 100 g's for 6 ms, 10 shocks	± (0.1 % + 0.0005 Ω) Δ*R*
Vibration, High Frequency	Frequency varied 10 to 2000 Hz, 20 g peak, 2 directions 6 h each	± (0.1 % + 0.0005 Ω) Δ*R*
Load Life	2000 h at rated power, + 25 °C, 1.5 h "ON", 0.5 h "OFF"	± (2.0 % + 0.0005 Ω) Δ*R*
Solderability	ANSI J-STD-002	95 % coverage
Bias Humidity	+ 85 °C, 85 % RH, 10 % bias, 1000 h	± (1.0 % + 0.0005 Ω) Δ*R*

Wirewound Resistors, Open Air, Current Sense, Low Value

FEATURES

- Open air design
- Low resistance values for all types of current sensing, voltage division and pulse applications including switching and linear supplies, instrumentation and power amplifiers
- All welded construction
- Solid metal nickel-chrome or copper-nickel alloy resistive element
- Solderable terminations
- Very low inductance
- Lead (Pb)-free version is RoHS compliant

Pb-free Available

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{70\,°C}$ W	TOLERANCE ± %	RESISTANCE RANGE Ω
SR1	1.0	1, 5	0.005 - 0.03
SR3	3.0	1, 5	0.005 - 0.05
SR5	5.0	1, 5	0.004 - 0.05

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	SR Resistor Characteristics
Temperature Coefficient	ppm/°C	0.004 Ω - 0.005 Ω = ± 300 0.0051 Ω - 0.0099 Ω = ± 175 0.01 Ω - 0.05 Ω = ± 100
Operating Temperature Range	°C	- 65 to + 275
Maximum Continuous Current	A	$(P/R)^{1/2}$

SAP ORDERING INFORMATION (Part Number 18 digits)

Global Part Numbering Example: SR55L000JE14

S	R	5	5	L	0	0	0	J	E	1	4			

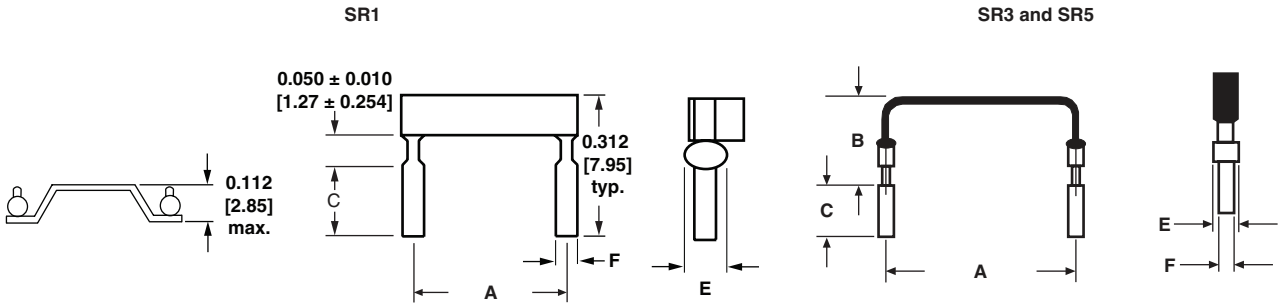
GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
SR1 **SR3** **SR5**	**L** = mΩ (below 0.01 Ω) **R** = Decimal **5L000** = 0.005 Ω **R0100** = 0.01 Ω	**F** = ± 1.0 % **J** = ± 5.0 % **K** = ± 10 %	**E14** = Lead (Pb)-free bulk **B14** = Tin/lead bulk	(Dash Number) (up to 3 digits) From **1 - 999** as applicable

* Pb containing terminations are not RoHS compliant, exemptions may apply

For technical questions, contact: ww2aresistors@vishay.com
Document Number: 31067
Revision: 22-Nov-07

Wirewound Resistors, Open Air, Current Sense, Low Value

DIMENSIONS in inches [millimeters]



MODEL	DIMENSIONS in inches [millimeters]				
	A	B	C	E	F
SR1	0.450 + 0.020 [11.43 + 0.508]	-	0.125 ± 0.030 [3.18 ± 0.762]	0.070 [1.78]	0.040 ± 0.002 [1.02 ± 0.051]
SR3	0.600 + 0.040/- 0.020 [15.24 + 1.020/- 0.508]	1.0 maximum [25.4 maximum]		0.065 + 0.010/- 0.005 [1.65 + 0.254/- 0.127]	
SR5	0.800 + 0.040/- 0.020 [20.32 + 1.020/- 0.508]				

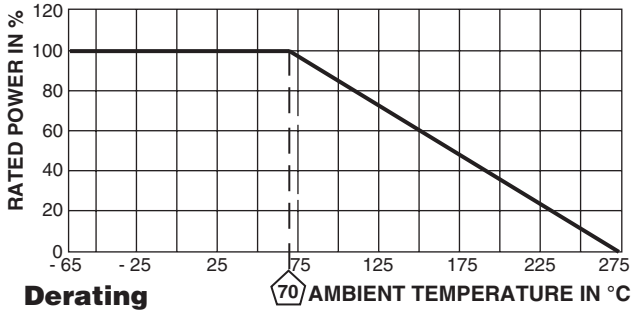
MATERIAL SPECIFICATIONS

Element: Nickel-chrome or copper-nickel alloy depending on resistance value

Terminals: Tinned copper

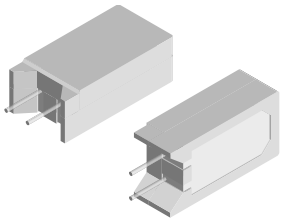
Encapsulation: None

Marking: None



PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Temperature Cycling	- 55 °C to + 125 °C, 1000 cycles, 15 min at each extreme	± (1.0 % + 0.0005 Ω) Δ*R*
Low Temperature Storage	- 65 °C for 24 h	± (0.5 % + 0.0005 Ω) Δ*R*
High Temperature Exposure	1000 h at + 275 °C	± (2.0 % + 0.0005 Ω) Δ*R*
Bias Humidity	+ 85 °C, 85 % RH, 10 % bias, 1000 h	± (1.0 % + 0.0005 Ω) Δ*R*
Mechanical Shock	100 g's for 11 ms, 5 pulses	± (0.2 % + 0.0005 Ω) Δ*R*
Vibration	Frequency varied 10 to 2000 Hz in 1 min, 3 directions, 12 h	± (0.2 % + 0.0005 Ω) Δ*R*
Load Life	1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"	± (2.0 % + 0.0005 Ω) Δ*R*
Resistance to Solder Heat	+ 260 °C solder, 10 - 12 s dwell, 25 mm/s emergence	± (0.5 % + 0.0005 Ω) Δ*R*
Moisture Resistance	MIL-STD-202 Method 106, 0 % power, 7a and 7b not required	± (0.5 % + 0.0005 Ω) Δ*R*

Wirewound/Metal Film Resistors, Commercial Power, Vertical Mount



FEATURES

- Space saving
- Direct mounting on printed circuit board
- Meets or exceeds requirements of EIA-Standard RS-344
- High power to size ratio
- Special inorganic potting compound and ceramic case provide high thermal conductivity in a fireproof package

Pb-free Available

e3

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	HISTORICAL MODEL	POWER RATING $P_{70\ °C}$ W	TOLERANCE ± %	RESISTANCE RANGE Ω	WEIGHT (Typical) g
CPCL02	CPCL-2	2	5, 10	0.01 - 0.10	3.5
CPCC02	CPCC-2	2	5, 10	0.1 - 500	3.5
CPCP02	CPCP-2	2	1, 5	0.1 - 4K	3.5
CPCF02	CPCF-2	2	1, 5, 10	501 - 150K	3.5
CPCL03	CPCL-3	3	5, 10	0.01 - 0.10	5.5
CPCC03	CPCC-3	3	5, 10	0.1 - 800	5.5
CPCP03	CPCP-3	3	1, 5	0.1 - 5K	5.5
CPCF03	CPCF-3	3	1, 5, 10	801 - 150K	5.5
CPCL05	CPCL-5	5	5, 10	0.01 - 0.10	6.9
CPCC05	CPCC-5	5	5, 10	0.1 - 800	6.9
CPCP05	CPCP-5	5	1, 5	0.1 - 5K	6.9
CPCF05	CPCF-5	5	1, 5, 10	801 - 150K	6.9
CPCP07	CPCP-7	7	3, 5, 10	0.1 - 430	9.2
CPCL10	CPCL-10	10	5, 10	0.01 - 0.10	14.3
CPCC10	CPCC-10	10	5, 10	0.1 - 1.5K	14.3
CPCP10	CPCP-10	10	1, 5	0.1 - 8K	14.3

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CPCLxx	CPCCxx	CPCPxx	CPCFxx
Temperature Coefficient	ppm/°C	0.01 Ω - 0.049 Ω = ± 400 0.05 Ω - 0.1 Ω = ± 100	0.1 Ω - 0.99 Ω = ± 600 1.0 Ω and above = ± 300	0.1 Ω - 0.99 Ω = ± 90 1.0 Ω - 9.9 Ω = ± 50 10 Ω and above = ± 20	± 50 all values
Short Time Overload	-	5 x rated power for 5 s			
Maximum Working Voltage	V	$(P \times R)^{1/2}$			
Operating Temperature Range	°C	- 65/+ 275			- 65/+ 225
Terminal Strength	lb	10 minimum			
Dielectric Withstanding Voltage	V_{AC}	1000			

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CPCC0515R00JB32 (preferred part number format)

C	P	C	C	0	5	1	5	R	0	0	J	B	3	2			

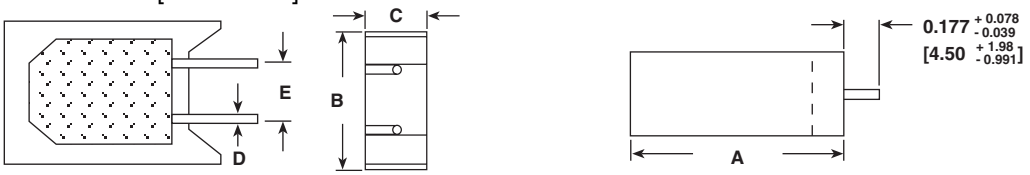
GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
(See Standard Electrical Specifications Global Model column for options)	**R** = Decimal **K** = Thousand **R1500** = 0.15 Ω **1K500** = 1500 Ω	**F** = ± 1.0 % **H** = ± 3.0 % **J** = ± 5.0 % **K** = ± 10.0 %	**E32** = Lead (Pb)-free two layer bulk **E01** = Lead (Pb)-free skin pack **B32** = Tin/lead two layer bulk **J01** = Tin/lead skin pack	(Dash Number) (up to 3 digits) From **1 - 999** as applicable

Historical Part Number example: CPCC-5 15 Ω 5 % B32 (will continue to be accepted for tin/lead product only)

CPCC-5	15 Ω	5 %	B32
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

* Pb containing terminations are not RoHS compliant, exemptions may apply

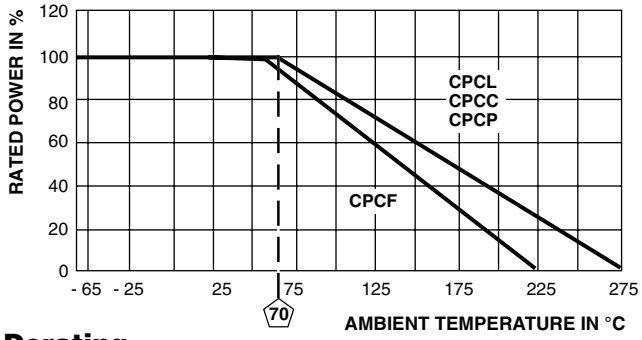
DIMENSIONS in inches [millimeters]



GLOBAL MODEL	DIMENSIONS in inches [millimeters]				
	A ± 0.031 [0.794]	B ± 0.031 [0.794]	C + 0.043 [1.09] - 0.012 [0.305]	D ± 0.005 [0.127]	E ± 0.040 [1.02]
CPCL02 CPCC02 CPCP02 CPCF02	0.807 [20.50]	0.433 [11.00]	0.276 [7.01]	0.032 [0.813]	0.197 [5.00]
CPCL03 CPCC03 CPCP03 CPCF03	0.984 [24.99]	0.472 [11.99]	0.315 [8.00]	0.032 [0.813]	0.197 [5.00]
CPCL05 CPCC05 CPCP05 CPCF05	1.003 [25.48]	0.512 [13.00]	0.354 [8.99]	0.032 [0.813]	0.197 [5.00]
CPCP07	1.535 ± 0.059 [39.00 ± 1.50]	0.512 ± 0.043 [13.00 ± 1.10]	0.354 ± 0.043 [9.00 ± 1.10]	0.032 ± 0.005 [0.813 ± 0.127]	0.197 + 0.079/-0.039 [5.00 + 2.0/- 1.0]
CPCL10 CPCP10	1.372 [34.85]	0.633 [16.08]	0.485 [12.32]	0.040 [1.02]	0.290 [7.37]
CPCC10				0.036 [0.914]	

MATERIAL SPECIFICATIONS

Part Marking: DALE, model, wattage, value, tolerance, date code
CPCL: Element: Self-supporting copper-nickel alloy or nickel-chrome alloy, depending on resistance value
Body: Steatite ceramic case with inorganic potting compound
Terminals: Tinned copper
CPCC: Element: Copper-nickel alloy or nickel-chrome alloy, depending on resistance value
Core: Woven fiberglass
Body: Steatite ceramic case with inorganic potting compound
End Caps: Tin plated steel
Terminals: Tinned copper
CPCP: Element: Copper-nickel alloy or nickel-chrome alloy, depending on resistance value
Core: Ceramic
Body: Steatite ceramic case with inorganic potting compound
End Caps: Stainless steel (CPCP07 is tin plated CRS)
Terminals: Tinned Copperweld® (CPCP07 is tin plated copper)
CPCF: Element: Metal film - nickel-chrome alloy
Core: Alumina ceramic
Body: Steatite ceramic case with inorganic potting compound
End Caps: Brass alloy
Terminals: Solder-coated copper

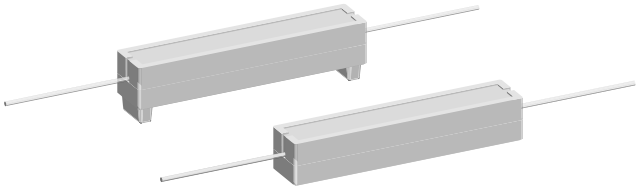


Derating

PERFORMANCE

TEST	CONDITIONS OF TEST	CPCP TEST LIMITS	CPCC, CPCL, CPCF TEST LIMITS
Thermal Shock	- 55 °C to + 275 °C, 5 cycles, 30 min dwell time	± (2.0 % + 0.05 Ω) ΔR	± (5.0 % + 0.05 Ω) ΔR
Short Time Overload	5 x rated power for 5 s	± (2.0 % + 0.05 Ω) ΔR	± (4.0 % + 0.05 Ω) ΔR
Dielectric Withstanding Voltage	1000 V_{rms} for 1 min	± (0.1 % + 0.05 Ω) ΔR	± (2.0 % + 0.05 Ω) ΔR
Low Temperature Storage	- 65 °C, full rated working voltage for 45 min	± (2.0 % + 0.05 Ω) ΔR	± (3.0 % + 0.05 Ω) ΔR
Bias Humidity	75 °C, 90 % - 100 % RH, 240 h	± (2.0 % + 0.05 Ω) ΔR	± (5.0 % + 0.05 Ω) ΔR
Load Life	1000 h at rated power, + 40 °C, 1.5 h "ON", 0.5 h "OFF"	± (5.0 % + 0.05 Ω) ΔR	± (5.0 % + 0.05 Ω) ΔR
Terminal Strength	5 to 10 s 10 pound pull test	± (1.0 % + 0.05 Ω) ΔR	± (1.0 % + 0.05 Ω) ΔR
Resistance to Solder Heat	Terminal immersed 3.5 s in molten solder up to body	± (1.0 % + 0.05 Ω) ΔR	± (4.0 % + 0.05 Ω) ΔR

Wirewound Resistors, Commercial Power, Axial Lead, Low Value



FEATURES

- High power to size ratio
- Low inductance
- Ceramic cases are available with circuit board stand-offs (designated with a -3 model ending)
- Superior surge capability
- Extremely low resistance values
- Complete welded construction
- Special inorganic potting compound and ceramic case provide high thermal conductivity in a fireproof package

Pb-free Available

e3

RoHS* COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	HISTORICAL MODEL	POWER RATING $P_{40\,°C}$ W	RESISTANCE RANGE (1) Ω ± 5 % Standard (2)	WEIGHT (Typical) g
CPL03	CPL-3	3	0.01 - 0.10	3.4
CPL03...3	CPL-3-3	3	0.01 - 0.10	3.6
CPL05	CPL-5	5	0.01 - 0.10	4.8
CPL05...3	CPL-5-3	5	0.01 - 0.10	5.0
CPL07	CPL-7	7	0.01 - 0.10	6.8
CPL07...3	CPL-7-3	7	0.01 - 0.10	7.0
CPL10	CPL-10	10	0.01 - 0.10	9.5
CPL10...3	CPL-10-3	10	0.01 - 0.10	9.9
CPL15	CPL-15	15	0.01 - 0.10	16.8
CPL15...3	CPL-15-3	15	0.01 - 0.10	17.4

Notes

(1) Resistance is measured 3/8" [9.52 mm] from resistor body.

(2) ± 1 % and ± 3 % available

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CPL RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 300
Short Time Overload	-	5 × rated power for 5 s
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Operating Temperature Range	°C	- 65/+ 275
Terminal Strength	lb	10 minimum
Dielectric Withstanding Voltage	V_{AC}	1000

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CPL05R0500JB143 (preferred part numbering format)

C	P	L	0	5	R	0	5	0	0	J	B	1	4	3		

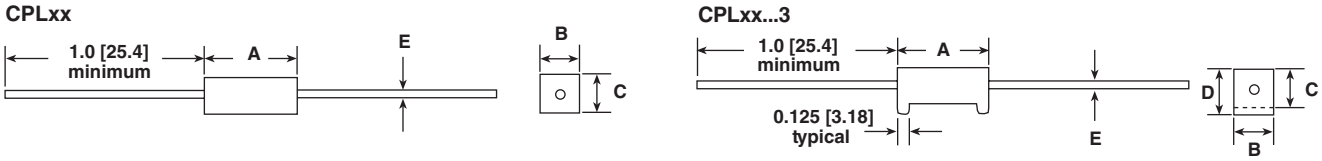
GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
CPL03 **CPL05** **CPL07** **CPL10** **CPL05**	**R** = Decimal **R1000** = 0.10 Ω	**F** = ± 1.0 % **G** = ± 2.0 % **H** = ± 3.0 % **J** = ± 5.0 % **K** = ± 10.0 %	**E14** = Lead (Pb)-free bulk **E31** = Lead (Pb)-free four layer bulk **E01** = Lead (Pb)-free skin pack **B14** = Tin/lead bulk **B31** = Tin/lead four layer bulk **J01** = Tin/lead skin pack	(Dash Number) (up to 3 digits) From **1 - 999** as applicable

Historical Part Number example: CPL-5-3 0.05 Ω 5 % B14 (will continue to be accepted)

CPL-5-3	0.05 Ω	5 %	B14
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

* Pb containing terminations are not RoHS compliant, exemptions may apply

DIMENSIONS in inches [millimeters]



GLOBAL MODEL	DIMENSIONS in inches [millimeters]				
	A (1) ± 0.031 [0.794]	B ± 0.031 [0.794]	C ± 0.031 [0.794]	C ± 0.031 [0.794]	E ± 0.001 [0.025]
CPL03	0.875 [22.22]	0.313 [7.94]	0.313 [7.94]	-	0.032 [0.813]
CPL03...3	0.875 [22.22]	0.313 [7.94]	0.313 [7.94]	0.375 [9.52]	0.032 [0.813]
CPL05	0.875 [22.22]	0.375 [9.52]	0.344 [8.73]	-	0.032 [0.813]
CPL05...3	0.875 [22.22]	0.375 [9.52]	0.344 [8.73]	0.406 [10.32]	0.032 [0.813]
CPL07	1.391 [35.32]	0.375 [9.52]	0.344 [8.73]	-	0.032 [0.813]
CPL07...3	1.391 [35.32]	0.375 [9.52]	0.344 [8.73]	0.469 [11.91]	0.032 [0.813]
CPL10	1.875 [47.62]	0.375 [9.52]	0.344 [8.73]	-	0.032 [0.813]
CPL10...3	1.875 [47.62]	0.375 [9.52]	0.344 [8.73]	0.469 [11.91]	0.032 [0.813]
CPL15	1.875 [47.62]	0.500 [12.70]	0.500 [12.70]	-	0.032 [0.813]
CPL15...3	1.875 [47.62]	0.500 [12.70]	0.500 [12.70]	0.625 [15.87]	0.032 [0.813]

Note

(1) Potting compound may extend outside of ceramic case up to 0.060 [1.52] maximum per side.

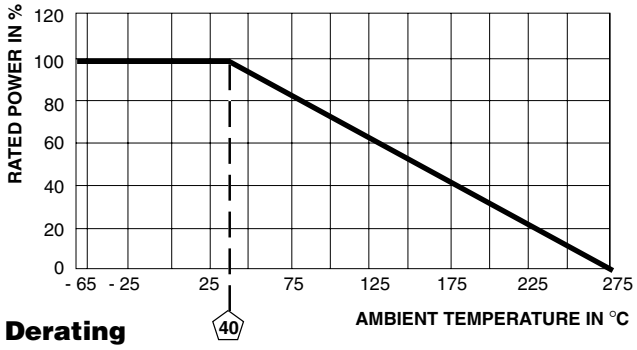
MATERIAL SPECIFICATIONS

Element: Self-supporting copper-nickel alloy or nickel-chrome alloy, depending on resistance range

Body: Steatite ceramic case with inorganic potting compound

Terminals: Tinned copper

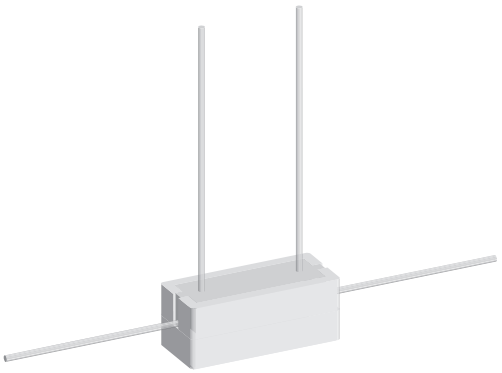
Part Marking: DALE, model, wattage, value, tolerance, date code



Derating

PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS (EIA RS-344)**
Thermal Shock	- 55 °C to + 275 °C, 5 cycles, 30 min dwell time	± (5.0 % + 0.05 Ω) ΔR
Short Time Overload	5 x rated power for 5 s	± (4.0 % + 0.05 Ω) ΔR
Dielectric Withstanding Voltage	1000 V_{rms} for 1 min	± (2.0 % + 0.05 Ω) ΔR
Low Temperature Operation	- 65 °C, full rated working voltage for 45 min	± (3.0 % + 0.05 Ω) ΔR
Bias Humidity	75 °C, 90 % - 100 % RH, 240 h	± (5.0 % + 0.05 Ω) ΔR
Load Life	1000 h at rated power, + 40 °C, 1.5 h “ON”, 0.5 h “OFF”	± (5.0 % + 0.05 Ω) ΔR
Terminal Strength	5 to 10 s 10 pound pull test, torsion test - 3 alternating directions, 360° each	± (1.0 % + 0.05 Ω) ΔR
Resistance to Solder Heat	Terminal immersed 3.5 s in molten solder at 1/8" to 3/16" from body	± (1.0 % + 0.05 Ω) ΔR

Wirewound Resistors, Commercial Power, Four Terminal, Low Value



FEATURES

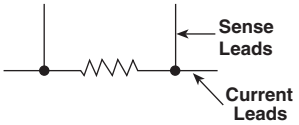
- Low Inductance
- Extremely low resistance values
- Current sensing
- Low temperature coefficients
- High power to size ratio
- Ceramic cases are available with circuit board stand-offs (designated with a -3 model ending)
- Superior surge capability
- Complete welded construction
- Special inorganic potting compound and ceramic case provide high thermal conductivity in a fireproof package

Pb-free Available

e3

RoHS* COMPLIANT

SCHEMATIC



STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	HISTORICAL MODEL	POWER RATING $P_{40\ °C}$ W	RESISTANCE RANGE Ω ± 5 % STANDARD, ± 3 % AVAILABLE	WEIGHT (TYPICAL) g
CPSL03...5	CPSL-3-5	3	0.01 to 0.10	4.0
CPSL03...3	CPSL-3-3	3	0.01 to 0.10	4.2
CPSL05...5	CPSL-5-5	5	0.01 to 0.10	5.2
CPSL05...3	CPSL-5-3	5	0.01 to 0.10	5.4
CPSL07...5	CPSL-7-5	7	0.01 to 0.10	7.6
CPSL10...5	CPSL-10-5	10	0.01 to 0.10	10.2
CPSL15...5	CPSL-15-5	15	0.01 to 0.10	18.9

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CPSL RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/°C	± 100 maximum
Short Time Overload	-	5 x rated power for 5 s
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Operating Temperature Range	°C	- 65/+ 275
Terminal Strength	lb	10 minimum
Dielectric Withstanding Voltage	V_{AC}	1000

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CPSL05R0500JB143 (preferred part number format)

C	P	S	L	0	5	R	0	5	0	0	J	B	1	4	3		

GLOBAL MODEL	VALUE	TOLERANCE	PACKAGING	SPECIAL
CPSL03 **CPSL05** **CPSL07** **CPSL10** **CPSL15**	**R** = Decimal **R1000** = 0.10 Ω	**F** = ± 1.0 % **G** = ± 2.0 % **H** = ± 3.0 % **J** = ± 5.0 % **K** = ± 10.0 %	**E14** = Lead (Pb)-free bulk **E31** = Lead (Pb)-free four layer bulk **B14** = Tin/lead bulk **B31** = Tin/lead four layer bulk	(Dash Number) (up to 3 digits) From **1 - 999** as applicable

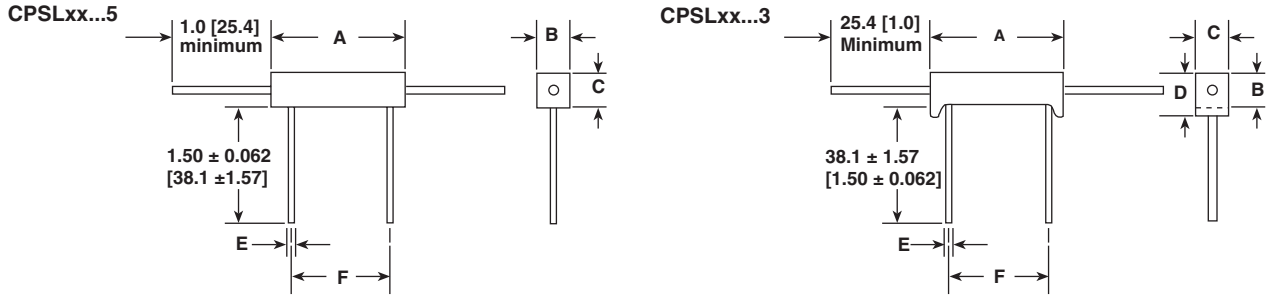
Historical Part Number example: CPSL-5-3 0.05 Ω 5 % B14 (will continue to be accepted)

CPCSL-5-3	0.05 Ω	5 %	B14
HISTORICAL MODEL	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

* Pb containing terminations are RoHS compliant, exemptions may apply

Wirewound Resistors, Commercial Power, Four Terminal, Low Value

DIMENSIONS in inches [millimeters]



GLOBAL MODEL	DIMENSIONS in inches [millimeters]					
	A (1) ± 0.031 [0.794]	B ± 0.031 [0.794]	C ± 0.031 [0.794]	D ± 0.031 [0.794]	E ± 0.001 [0.025]	F ± 0.063 [1.59]
CPSL03...5	0.875 [22.22]	0.313 [7.94]	0.313 [7.94]	-	0.036 [0.914]	0.563 [14.30]
CPSL03...3	0.875 [22.22]	0.313 [7.94]	0.313 [7.94]	0.375 [9.52]	0.036 [0.914]	0.563 [14.30]
CPSL05...5	0.875 [22.22]	0.375 [9.52]	0.344 [8.73]	-	0.036 [0.914]	0.563 [14.30]
CPSL05...3	0.875 [22.22]	0.375 [9.52]	0.344 [8.73]	0.438 [11.11]	0.036 [0.914]	0.563 [14.30]
CPSL07...5	1.391 [35.32]	0.375 [9.52]	0.344 [8.73]	-	0.036 [0.914]	1.000 [25.40]
CPSL10...5	1.875 [47.62]	0.375 [9.52]	0.344 [8.73]	-	0.036 [0.914]	1.375 [34.93]
CPSL15...5	1.875 [47.62]	0.500 [12.70]	0.500 [12.70]	-	0.036 [0.914]	1.375 [34.93]

Note
(1) Potting compound may extend outside of ceramic case up to 0.060 [1.52] maximum per side.

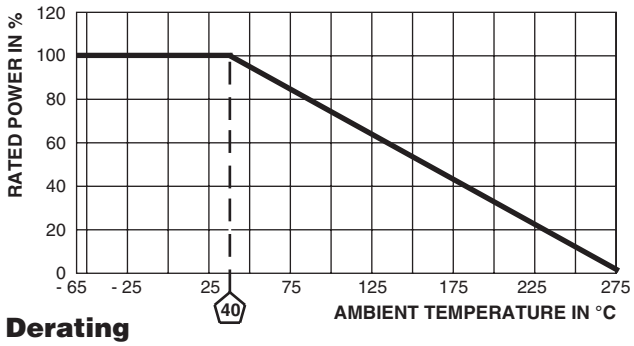
MATERIAL SPECIFICATIONS

Element: Self-supporting Copper-Nickel alloy or Nickel-Chrome alloy, depending on resistance value

Body: Steatite ceramic case with inorganic potting compound

Terminals: Tinned copper

Part Marking: Dale, model, wattage, value, tolerance, date code



Derating

PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal Shock	- 55 °C to + 275 °C, 5 cycles, 30 min dwell time	± (5.0 % + 0.05 Ω) Δ*R*
Short Time Overload	5 x rated power for 5 s	± (4.0 % + 0.05 Ω) Δ*R*
Dielectric Withstanding Voltage	1000 V_{rms} for 1 min	± (2.0 % + 0.05 Ω) Δ*R*
Low Temperature Operation	- 65 °C, full rated working voltage for 45 min	± (3.0 % + 0.05 Ω) Δ*R*
Bias Humidity	75 °C, 90 % - 100 % RH, 240 h	± (5.0 % + 0.05 Ω) Δ*R*
Load Life	1000 h at rated power, + 40 °C, 1.5 h “ON”, 0.5 h “OFF”	± (5.0 % + 0.05 Ω) Δ*R*
Terminal Strength	5 to 10 s 10 pound pull test, torsion test - 3 alternating directions, 360° each	± (1.0 % + 0.05 Ω) Δ*R*
Resistance to Solder Heat	Terminal immersed 3.5 s in molten solder at 1/8" to 3/16" from body	± (1.0 % + 0.05 Ω) Δ*R*

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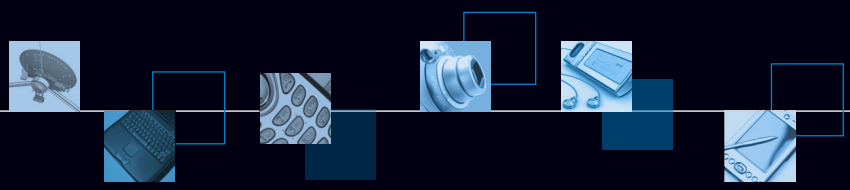

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