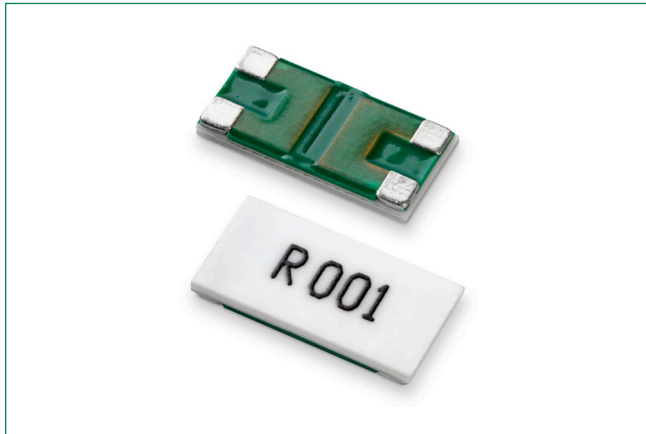


# Four-Terminal Surface Mount Resistor

AEC-Q200 Qualified &gt; L4CL-A Series

**HF** **RoHS** **Pb**

## Description

Littelfuse L4CL-A Series Kelvin sensing, low resistance, high power chip resistors exhibit excellent performance in resistance, noise performance, surface heat distribution and have a lower surface temperature.

## Features

- Resistance range down to 0.5 mΩ
- Separate voltage sensing terminals
- Ceramic substrate
- AEC-Q200 Qualified

## Benefits

- Small size
- High voltage

## Application

- Power management
- Low ESL
- Server
- Automotive

## Additional Information



Resources



Accessories



Samples

## Electrical Specifications

Part Number	Resistance		Power Rating (W)	TCR (ppm / °C)	Standard Package Quantity
	Ro (mΩ)	Rt (%)			
L4CL1206LOM50FNR-A	0.5	±1.0%	0.5	±100	5000
L4CL1206LR001FNR-A	1	±1.0%	0.5	±75	5000
L4CL1206LR002FNR-A	2	±1.0%	0.5	±75	5000
L4CL1206LR003FNR-A	3	±1.0%	0.5	±75	5000
L4CL1206LR004FNR-A	4	±1.0%	0.5	±75	5000
L4CL1206LR005FNR-A	5	±1.0%	0.5	±50	5000
L4CL1206LR006FNR-A	6	±1.0%	0.5	±50	5000
L4CL1206LR007FNR-A	7	±1.0%	0.5	±50	5000
L4CL1206LR008FNR-A	8	±1.0%	0.5	±50	5000
L4CL1206LR009FNR-A	9	±1.0%	0.5	±50	5000
L4CL1206LR010DNR-A	10	±0.5%	0.5	±30	5000
L4CL1206LR011DNR-A	11	±0.5%	0.5	±30	5000
L4CL1206LR012DNR-A	12	±0.5%	0.5	±30	5000
L4CL1206LR013DNR-A	13	±0.5%	0.5	±30	5000
L4CL1206LR014DNR-A	14	±0.5%	0.5	±30	5000
L4CL1206LR015DNR-A	15	±0.5%	0.5	±30	5000
L4CL1206LR016DNR-A	16	±0.5%	0.5	±30	5000
L4CL1206LR018DNR-A	18	±0.5%	0.5	±30	5000
L4CL1206LR020DNR-A	20	±0.5%	0.5	±30	5000
L4CL1206LR021DNR-A	21	±0.5%	0.5	±30	5000
L4CL1206LR022DNR-A	22	±0.5%	0.5	±30	5000
L4CL1206LR024DNR-A	24	±0.5%	0.5	±30	5000

# Four-Terminal Surface Mount Resistor

## AEC-Q200 Qualified > L4CL-A Series

### Electrical Specifications

Part Number	Resistance		Power Rating (W)	TCR (ppm / °C)	Standard Package Quantity
	Ro (mΩ)	Rt (%)			
L4CL1206LR027DNR-A	27	±0.5%	0.5	±30	5000
L4CL1206LR028DNR-A	28	±0.5%	0.5	±30	5000
L4CL1206LR030DNR-A	30	±0.5%	0.5	±30	5000
L4CL1206LR033DNR-A	33	±0.5%	0.5	±30	5000
L4CL1206LR034DNR-A	34	±0.5%	0.5	±30	5000
L4CL1206LR036DNR-A	36	±0.5%	0.5	±30	5000
L4CL1206LR039DNR-A	39	±0.5%	0.5	±30	5000
L4CL1206LR043DNR-A	43	±0.5%	0.5	±30	5000
L4CL1206LR047DNR-A	47	±0.5%	0.5	±30	5000
L4CL1206LR050DNR-A	50	±0.5%	0.5	±30	5000
L4CL1206LR051DNR-A	51	±0.5%	0.5	±30	5000
L4CL1206LR056DNR-A	56	±0.5%	0.5	±30	5000
L4CL1206LR059DNR-A	59	±0.5%	0.5	±30	5000
L4CL1206LR062DNR-A	62	±0.5%	0.5	±30	5000
L4CL1206LR068DNR-A	68	±0.5%	0.5	±30	5000
L4CL1206LR075DNR-A	75	±0.5%	0.5	±30	5000
L4CL1206LR082DNR-A	82	±0.5%	0.5	±30	5000
L4CL1206LR091DNR-A	91	±0.5%	0.5	±30	5000
L4CL1206LR100DNR-A	100	±0.5%	0.5	±30	5000
L4CL2512LOM50FYR-A	0.5	±1.0%	0.33	±100	4000
L4CL2512LR001FYR-A	1	±1.0%	0.5	±75	4000
L4CL2512LR002FYR-A	2	±1.0%	0.5	±75	4000
L4CL2512LR003FYR-A	3	±1.0%	1	±50	4000
L4CL2512LR004FYR-A	4	±1.0%	1	±50	4000
L4CL2512LR005FYR-A	5	±1.0%	1	±30	4000
L4CL2512LR006FYR-A	6	±1.0%	1	±30	4000
L4CL2512LR007FYR-A	7	±1.0%	1	±30	4000
L4CL2512LR008FYR-A	8	±1.0%	1	±30	4000
L4CL2512LR009FYR-A	9	±1.0%	1	±30	4000
L4CL2512LR010FYR-A	10	±1.0%	1	±30	4000
L4CL2512LR011FYR-A	11	±1.0%	1	±30	4000
L4CL2512LR012FYR-A	12	±1.0%	1	±30	4000
L4CL2512LR013FYR-A	13	±1.0%	1	±30	4000
L4CL2512LR014FYR-A	14	±1.0%	1	±30	4000
L4CL2512LR015FYR-A	15	±1.0%	1	±30	4000
L4CL2512LR016FYR-A	16	±1.0%	1	±30	4000
L4CL2512LR018FYR-A	18	±1.0%	1	±30	4000
L4CL2512LR020FYR-A	20	±1.0%	1	±30	4000
L4CL2512LR021FYR-A	21	±1.0%	1	±30	4000
L4CL2512LR022FYR-A	22	±1.0%	1	±30	4000
L4CL2512LR024FYR-A	24	±1.0%	1	±30	4000
L4CL2512LR027FYR-A	27	±1.0%	1	±30	4000

# Four-Terminal Surface Mount Resistor

## AEC-Q200 Qualified > L4CL-A Series

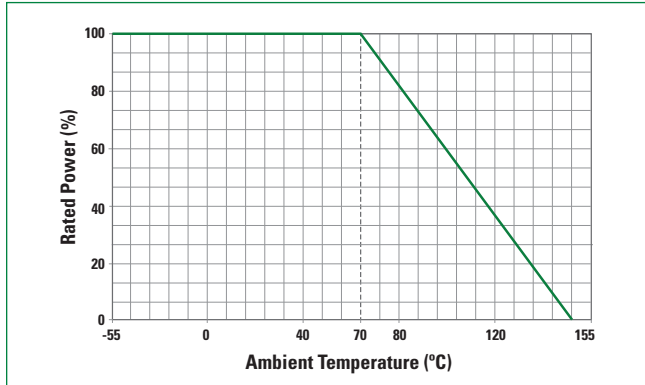
### Electrical Specifications

Part Number	Resistance		Power Rating (W)	TCR (ppm / °C)	Standard Package Quantity
	Ro (mΩ)	Rt (%)			
L4CL2512LR028FYR-A	28	±1.0%	1	±30	4000
L4CL2512LR030FYR-A	30	±1.0%	1	±30	4000
L4CL2512LR033FYR-A	33	±1.0%	1	±30	4000
L4CL2512LR034FYR-A	34	±1.0%	1	±30	4000
L4CL2512LR036FYR-A	36	±1.0%	1	±30	4000
L4CL2512LR039FYR-A	39	±1.0%	1	±30	4000
L4CL2512LR043FYR-A	43	±1.0%	1	±30	4000
L4CL2512LR047FYR-A	47	±1.0%	1	±30	4000
L4CL2512LR050FYR-A	50	±1.0%	1	±30	4000
L4CL2512LR051FYR-A	51	±1.0%	1	±30	4000
L4CL2512LR056FYR-A	56	±1.0%	1	±30	4000
L4CL2512LR059FYR-A	59	±1.0%	1	±30	4000
L4CL2512LR062FYR-A	62	±1.0%	1	±30	4000
L4CL2512LR068FYR-A	68	±1.0%	1	±30	4000
L4CL2512LR075FYR-A	75	±1.0%	1	±30	4000
L4CL2512LR082FYR-A	82	±1.0%	1	±30	4000
L4CL2512LR091FYR-A	91	±1.0%	1	±30	4000
L4CL2512LR100FYR-A	100	±1.0%	1	±30	4000

# Four-Terminal Surface Mount Resistor

AEC-Q200 Qualified > L4CL-A Series

## Temperature De-rating Curve



## Storage / Environment Conditions

Products should be stored under the following environmental conditions.

**Temperature:** +5 to +35 °C

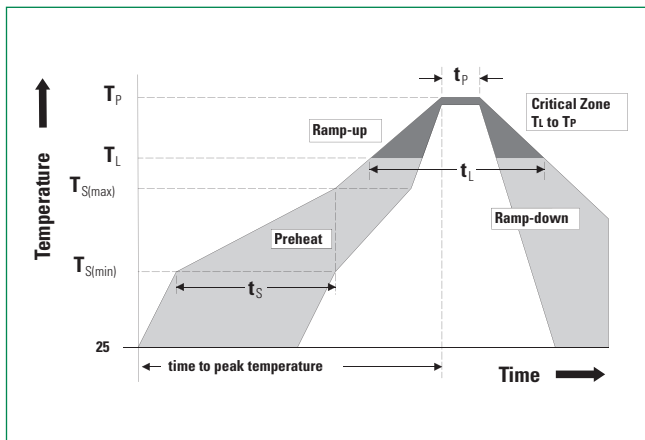
**Humidity:** 45 to 85% relative humidity

Do not keep products in environments where they may be subject to particulate contamination or harmful gases such as sulfuric acid or hydrogen chloride as it may cause oxidation on electrodes, resulting poor solderability.

Products should be stored in a space that does not expose to high temperatures, vibration, or direct sunlight.

Products should be stored in the original airtight packaging until use.

## Soldering Parameters–Wave Soldering



Profile Feature	Pb-Free Assembly
<b>Average Ramp-Up Rate (<math>T_{S(max)}</math> to <math>T_p</math>)</b>	3 °C / second max
<b>Preheat</b>	
Temperature Minimum ( $T_{S(min)}$ )	150 °C
Temperature Maximum ( $T_{S(max)}$ )	200 °C
Time ( $T_{S(min)}$ to $T_{S(max)}$ )	60–180 seconds
<b>Time maintained above</b>	
Temperature Minimum ( $T_l$ )	217 °C
Time ( $t_L$ )	60–150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>	260 ±0 °C
<b>Time within 5 °C of Actual Peak Temperature (<math>t_p</math>)</b>	20–40 seconds
<b>Ramp-Down Rate</b>	6 °C / second Maximum
<b>Time 25 °C to Peak Temperature</b>	8 minutes Maximum

# Four-Terminal Surface Mount Resistor

## AEC-Q200 Qualified > L4CL-A Series

### AEC-Q200 Reliability Specifications

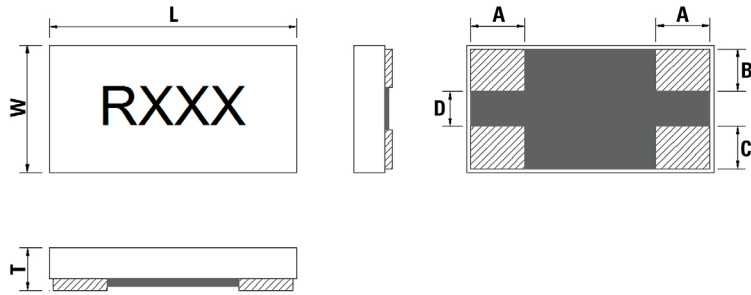
Test	Procedure	Specifications
<b>High Temp. Exposure (Storage)</b> MIL-STD-202, Method 108	Test Temp 170 °C Test Period: 1,000 hours No Electrical Load	±1.0%
<b>Temp. Cycling (Thermal Shock)</b> JESD22 Method JA-104	Repeat 1,000 cycles as follows: -55 +/-3 °C for 30 minutes 155 +/-3 °C for 30 minutes Transition time of 1 minute max	±1.0%
<b>Biased Humidity</b> MIL-STD-202, Method 103	Test conditions: 85 °C and 85% RH 10% of rated power Test Period 1,000 hours	±1.0%
<b>Load Life (Operational Life)</b> MIL-STD-202, Method 108	Test Temperature: 125 +/- 3 °C Applied voltage: rated power (derated Power will be required if temp exceeds the derating point of part) Test Period: 1,000 hours (condition D)	±1.0%
<b>Resistance to Solvents</b> MIL-STD-202, Method 215	3 minute soak, 2–3 ounce force, 10 strokes / repetition, 3 repetitions	No damage
<b>Mechanical Shock</b> MIL-STD-202, Method 213	Force: 100 G peak. Test duration: 6 ms, Half-sine waveform, Velocity: 12.3 ft / sec	±1.0%
<b>Vibration</b> MIL-STD-202, Method 204	Frequency: 10–2,000 Hz Acceleration: 5G Test duration: 20 minutes, 12 cycles	±1.0%
<b>Resistance to Soldering Heat</b> MIL-STD-202, Method 210	Condition B (Solder dip, no pre-heat) 260 °C	±1.0%
<b>ESD</b> AEC-Q200-002	HBM, 100 pF, 1.5 kΩ. Repetition: 5 times	±1.0%
<b>Solderability J-STD-002</b>	Non-activated flux dip: 5-10 seconds. SAC solder dip: 2 ± 0.5 seconds at 245 °C	95% coverage
<b>Flammability UL-94</b>	V-0 or V-1 are acceptable. Electrical test not required	Provide certificate
<b>Board Flex AEC-Q200-005</b>	90 mm span between fulcrums, 2 mm bend. 60 seconds minimum holding time	±1.0%
<b>Terminal Strength (SMD)</b> AEC-Q200-006	Force of 17.7 N 60 seconds	±1.0%
<b>Flame Retardance</b> AEC-Q200-001	Mounted parts subjected to voltages from 9.0 to 32 VDC (current clamped up to 500 A) in 1.0 VDC increments. Voltage applied for 1 hour minimum or until failure occurs	Must meet AEC-Q200 requirements

# Four-Terminal Surface Mount Resistor

## AEC-Q200 Qualified > L4CL-A Series

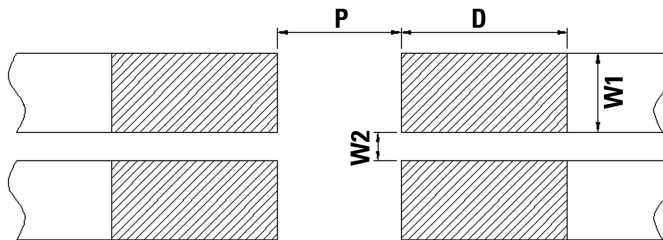
### Dimensions

All dimensions in mm



Part Number	W	L	T	A	B	C	D
L4CL1206-A	1.60±0.20	3.20±0.20	0.60±0.20	0.60±0.20	0.55±0.20	0.55±0.20	0.50±0.20
L4CL2512-A	3.10±0.20	6.30±0.20	0.60±0.20	0.95±0.20	1.05±0.20	1.05±0.20	1.00±0.20

### Recommended Land Pattern



Part Number	P	D	W1	W2	Loading
L4CL1206-A	1.20 mm	1.80 mm	1.10 mm	0.30 mm	0.5 W
L4CL2512-A	3.10 mm	2.00 mm	1.40 mm	0.70 mm	1.0 W

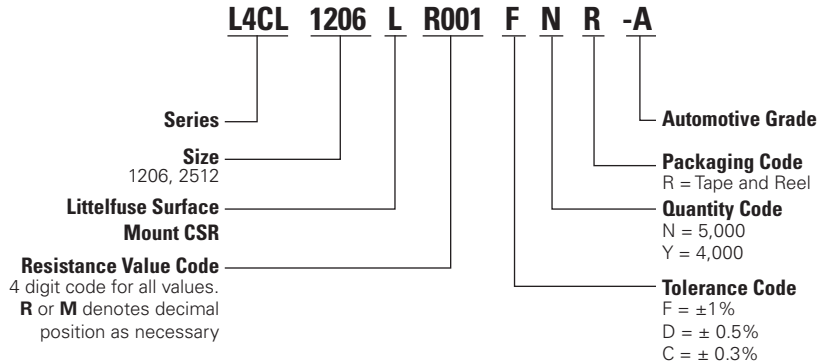
### Packaging

Part Number	Halogen Free	Packaging Option	Quantity	Quantity & Packaging Codes
L4CL1206-A	Yes	Tape and Reel	5000	NR
L4CL2512-A	Yes	Tape and Reel	4000	YR

# Four-Terminal Surface Mount Resistor

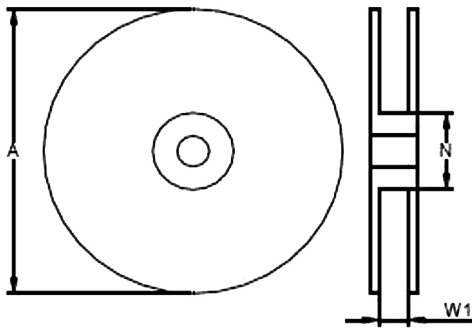
## AEC-Q200 Qualified > L4CL-A Series

### Part Numbering System

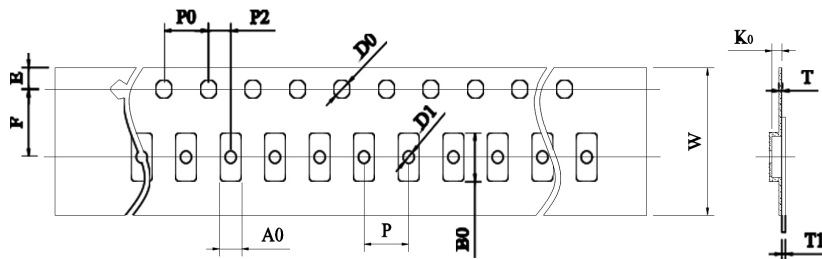


### Tape and Reel Specifications

All dimensions in mm



Part Number	A $\pm 5$ (mm)	N $\pm 2$ (mm)	W1 $\pm 1$ (mm)
L4CL1206-A	178	60	9.0
L4CL2512-A	178	60	13



Part Number	W	P0	P	P2	A0	B0	D0	F	E	T	T1	K0
L4CL1206-A	8.00 $\pm 0.30$	4.00 $\pm 0.10$	4.00 $\pm 0.10$	2.00 $\pm 0.10$	1.90 $\pm 0.20$	3.50 $\pm 0.20$	1.50 $\pm 0.10$	3.50 $\pm 0.10$	1.75 $\pm 0.10$	0.20 $\pm 0.10$	Max. 0.1	0.85 $\pm 0.20$
L4CL2512-A	12.00 $\pm 0.30$	4.00 $\pm 0.10$	4.00 $\pm 0.10$	2.00 $\pm 0.10$	3.40 $\pm 0.20$	6.75 $\pm 0.20$	1.50 $\pm 0.10$	5.50 $\pm 0.10$	1.75 $\pm 0.10$	0.25 $\pm 0.10$	Max. 0.1	0.81 $\pm 0.20$

**Note:** Tape and reel packaging in accordance to EIA-481

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