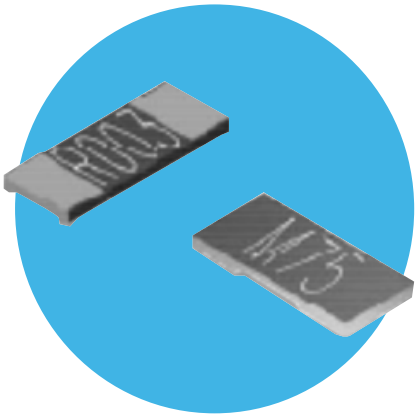
Metal Element Current Sense Resistor

ULR Series

- Robust metal strip able to withstand high temperature and high current.
- Low TCR and Inductance
- Resistance Range from 0.15mΩ to 10mΩ
- RoHS compliant
- AEC-Q200
- Higher wattage devices feature PCB clearance gap to maximize thermal performance



All parts are Pb-free and comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

Electrical Data

Type	Size	Coating	Power Rating @80°C (W)	Standard Resistance Value mΩ [1]	TCR (ppm/°C)	Tolerance (%)	Dielectric Withstanding Voltage (V)	Ambient Temperature (°C)
ULRG1 / ULR1S	1206	None [2]	1	0.2, 0.25, 0.3, 0.4, 0.5, 0.6	175	1, 5	N/A	-55 to +170
				0.75, 1, 1.2, 2, 2.5, 3, 3.5, 4, 5, 5.5, 6, 7, 8, 9, 10	50			
ULRG15 / ULR15S	2010		1.5	0.2, 0.25, 0.3, 0.4, 0.5	150			
				0.75, 1, 1.5, 2, 2.5, 3, 4, 5, 5.5, 6, 7, 8, 9, 10	50		200	
ULRG2 / ULR2	2512	Green	2	6.5, 7, 7.5, 8, 9, 10				
ULRG25 / ULR25			2.5	3.5, 4, 4.5, 5, 5.5, 6				
ULRG3 / ULR3			3	0.15, 0.25, 0.3, 0.4, 0.5, 0.75	150			
				1, 1.5, 2, 2.5, 3	50			
ULRB1 / ULR1		Black	1	0.5, 0.75, 1, 1.5, 2	50			
				2.5, 3, 3.5	150			
				4, 4.5, 5, 5.5, 10	100			
				6, 6.5, 7, 7.5	75			
ULRB2 / ULR2			2	0.5, 0.75, 1, 1.5, 2, 3	50			

Notes: 1. For higher resistance values please refer to LRMA series. 2. Package sizes 1206 and 2010 are uncoated on the top surface and unmarked.

Performance Data

AEC-Q200 Table 7 ref.	Test	Method		Max. (add R0005)	
				Black & uncoated	Green
3	High Temp. Exposure *	MIL-STD-202 Method 108	ΔR%	1	1
4	Temperature Cycling	JESD22 Method JA-104	ΔR%	0.5	1
6	Moisture Resistance	MIL-STD-202 Method 106	ΔR%	1	1
7	Biased Humidity	MIL-STD-202 Method 103	ΔR%	1	1
8	Operational Life (Cyclic Load) *	MIL-STD-202 Method 108	ΔR%	1	1
14	Vibration	MIL-STD-202 Method 204	ΔR%	0.5	0.5
15	Resistance to Soldering Heat *	MIL-STD-202 Method 210	ΔR%	0.5	1
16	Thermal Shock *	MIL-STD-202 Method 107	ΔR%	0.5	1
18	Solderability	J-STD-002		>95% coverage	
21	Board Flex	AEC-Q200-005	ΔR%	0.5	0.5
22	Terminal Strength	AEC-Q200-006	ΔR%	0.25	0.25
	Short Term Overload *	5 x Pr for 5s	ΔR%	0.5	1

Notes: 1. Full AEC-Q200 qualification applies to 2512 size. The 1206 and 2010 sizes have received the tests marked *.

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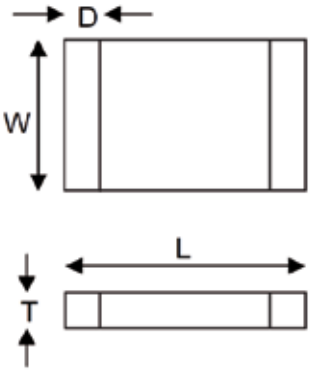
Physical Data

Dimensions(mm) and weight (mg)

Size	Coating	Values	L (±0.25)	W	T (±0.2)	D	Wt (nom)
1206	None	0.2, 0.25	3.2	1.6 ±0.3	1.0	1.5 ±0.25	25
		0.3				1.4 ±0.25	
		0.4				1.4 ±0.25	
		0.5, 0.6, 1 ,4, 5, 6		1.6 ±0.1	0.6	1.1 ±0.25	20
		2, 3, 10				0.6 ±0.25	
		7, 8, 9				0.9 ±0.25	
2010		0.2	5.08	2.54 ±0.3	1.0	2.34 ±0.25	50
		0.25				2.24 ±0.25	
		0.3				2.04 ±0.25	
		0.4				1.84 ±0.25	
		0.5, 1, 4, 5		2.54 ±0.15	0.6	1.84 ±0.25	40
		2, 6, 7, 8				1.54 ±0.25	
		3				1.04 ±0.25	
		9,1 0				1.29 ±0.25	
2512	Green	0.15	6.35	3.0 ±0.3	1.0	2.98 ±0.25	60
		0.2				2.88 ±0.25	
		0.25, 3				2.68 ±0.25	
		0.4				2.18 ±0.25	
		0.5 - 0.75		3.18 ±0.35	1.0	1.93 ±0.75	
		1 - 10			0.6		
	Black	0.5		3.18 ±0.25	1.4	1.3 ±0.38	
		0.75, 2.5			1.0		
		1			0.8		
		1.5			0.65		
		2, 5, 6			0.5		
		3			0.7		
		3.5			0.71		
		4			0.6		
		4.5			0.58		
		5.5, 6.5			0.47		
		7			0.45		
		10			0.8	1.9 ±0.15	



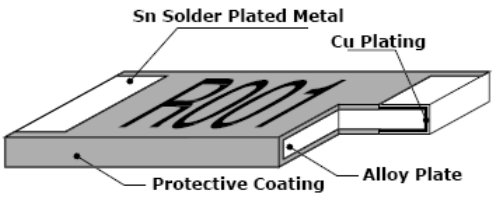
Construction

Black coat
A low TCR resistance alloy plate, with tin plated connection bands is protectively coated on the upper and lower faces and numerically marked with the resistance value. This part is suitable for wave or reflow soldering.

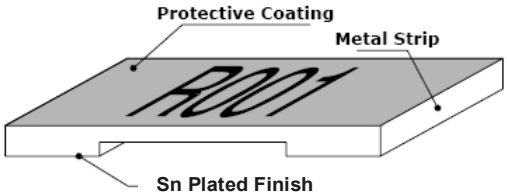
Green coat
A low TCR resistance alloy plate is grooved to set the final resistance, the lower faces are tin plated for connections, and it is protectively coated on the upper and lower faces and numerically marked with the resistance value. This part is ONLY suitable for reflow soldering.

Uncoated
A low TCR resistance alloy plate is grooved to set the final resistance and the lower face only is protected with an epoxy coating. The lower faces are tin plated for connections. This part is ONLY suitable for reflow soldering.

Marking
Only 2512 size parts are marked. For values which are integer numbers of milliohms, the marking is 4-character IEC62 code; e.g. “R002” for 2mΩ, “R010” for 10mΩ. For values including fractions of a milliohm the marking is 3 or 4-character code using “M” to indicate the decimal point, e.g. “M75” for 0.75mΩ, “1M50” for 1.5mΩ.



Black



Green Coat & Uncoated

Termination Details:

Material	Matt tin plated finish over a barrier layer
Solderability	95% min coverage (MIL-STD 202F / 208H, 235ºC 2 secs)

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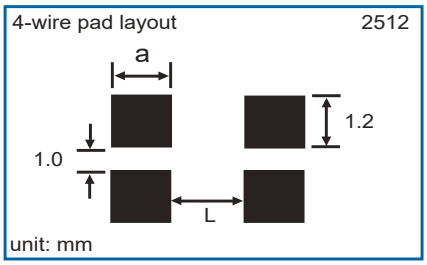
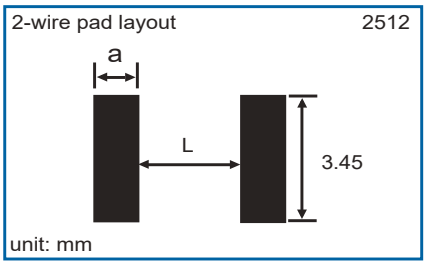
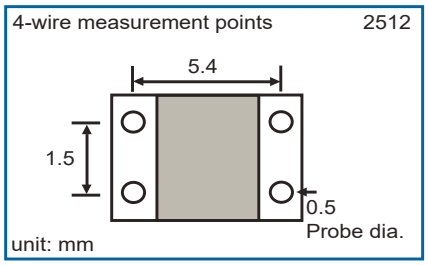
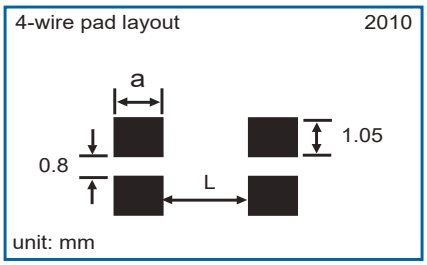
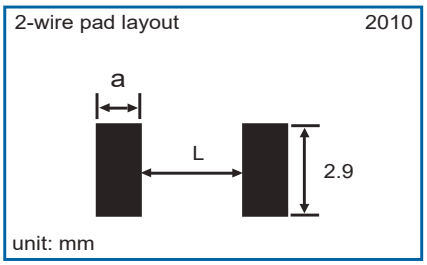
Electrical Connections

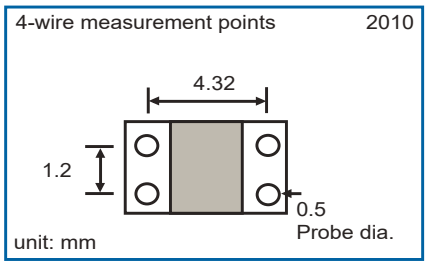


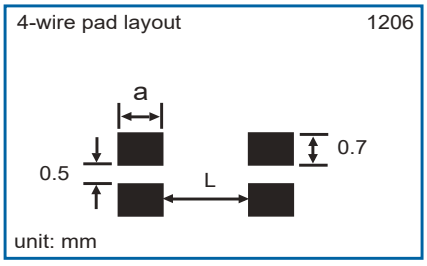


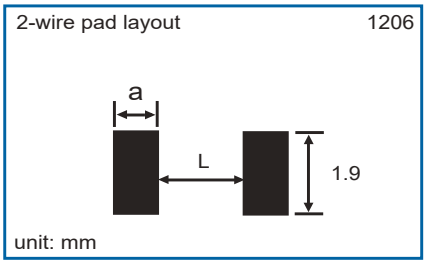


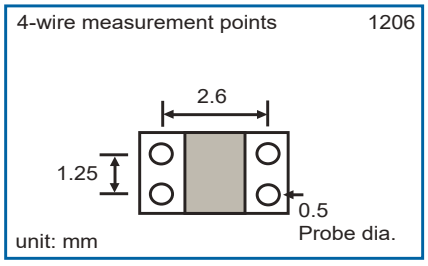






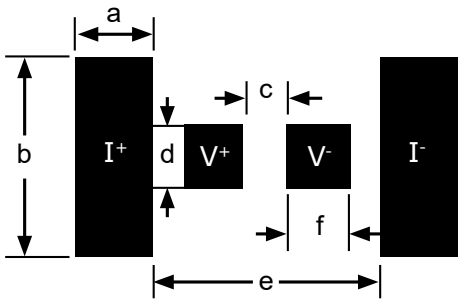






Package	Resistance (mΩ)	a	L
1206	0.5, 0.6	1.55	0.55
	1, 4 – 6	1.55	0.55
	2 – 3, 10	1.05	1.55
	7 – 9	1.35	0.95
2010	0.5, 1, 4 - 5	2.29	0.95
	2, 6 – 8	1.99	1.55
	3	1.49	2.55
	9 - 10	1.74	2.05
2512 - Black	All	2.7	2.9
2512 - Green	0.5	3.13	0.52
	0.75	2.93	0.94
	1	2.38	2.04
	1.5	1.88	3.04
	2 - 3	1.63	3.54
	4, 4.5	2.63	1.54
	5 - 6	2.38	2.04
	6.5, 7	1.88	3.04
	8 - 10	1.63	3.54

Package	Resistance (mΩ)	a	b	c	d	e	f
1206	0.2 - 0.4	0.75	1.9	0.6	0.6	2.15	0.4
2010	0.2 - 0.4	1.35	2.89	0.6	0.6	3.08	1.4
2512 - Green	0.15 - 0.3	2	3.4	0.6	0.6	2.8	1.0
	0.4	1.5	3.4	0.6	0.6	3.8	2.0



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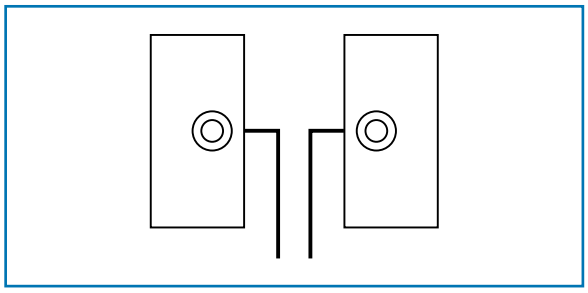
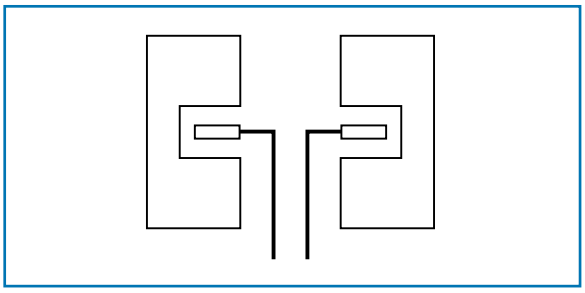
Suggested Alternative 4-Wire Design Methods

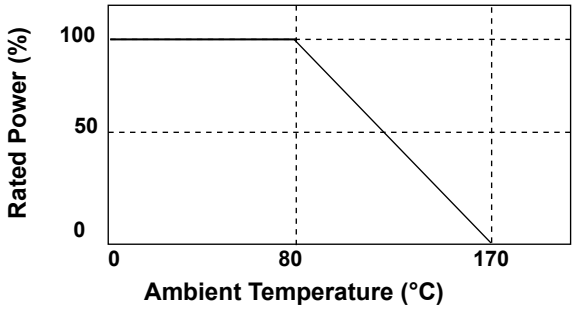


Vias with copper traces on internal layers.



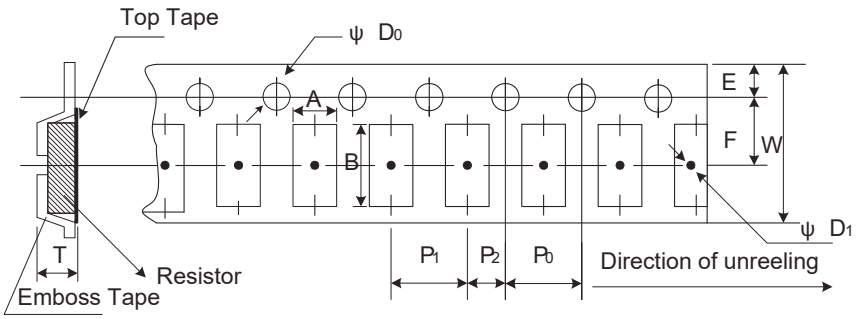
Sense traces on Solder pads beneath the chip

Power Derating Curve



Note:
The power derating curve is a guidance based on a conservative design model. The ULR is a solid metal alloy construction that can withstand significantly greater operating temperatures than the conservative model permits. The protective coating will operate up to 260°C and the alloy can withstand in excess of 350°C. Therefore, the system thermal design will be a more significant design parameter due to the heat limitations of the solder joint.

Plastic tape Specification



Type	Resistance (mΩ)	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	ΦD_1	T	Quantity (EA)
1206	1 -10	1.90 ± 0.1	3.60 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	1.0min.	0.87 ± 0.1	2,000
2010	1 -10	2.85 ± 0.1	5.55 ± 0.1	12.0 ± 0.2	1.75 ± 0.1	5.5 ± 0.05	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	1.4min	0.85 ± 0.1	2,000
2512 Black	0.50 - 0.75	3.40 ± 0.1	6.75 ± 0.1	12.0 ± 0.1	1.75 ± 0.1	5.5 ± 0.05	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	1.4min	1.45 ± 0.2	2,000
	1 - 10											0.81 ± 0.1	
2512 Green	0.15 -10	3.40 ± 0.1	6.75 ± 0.1	12.0 ± 0.1	1.75 ± 0.1	5.5 ± 0.05	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	1.4min	0.81 ± 0.1	2,000

Note:

1. The cumulative tolerance of 10 sprocket hole pitch is ± 0.2 mm.
2. Carrier camber shall not be more than 1 mm per 100 mm through a length of 250 mm.
3. A & B measured 0.3 mm from the bottom of the packet.
4. T measured at a point on the inside bottom of the packet to the top surface of the carrier.
5. Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

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Ordering Procedure

This product has two valid part numbers:

European (Welwyn) Part Number: ULR2-R0015FT2 (2512, 1.5 milliohms ±1%, Pb-free)

U	L	R	2	-	R	0	0	1	5	F	T	2
1					2					3	4	

1 Type	2 Value	3 Tolerance	4 Packing	
ULR1S	3 to 6 characters	F = ±1%	T2 = Plastic tape	
ULR1	R = ohms	J = ±5%	All sizes	2000/reel
ULR15S				
ULR2				
ULR25				
ULR3				

USA (IRC) Part Number: ULRB22512R0015FLFSLT (2512, 1.5 milliohms ±1%, Pb-free)

U	L	R	B	2	2	5	1	2	R	0	0	1	5	F	L	F	S	L	T
1					2				3					4	5		6		

1 Type	2 Size	3 Value	4 Tolerance	5 Termination	6 Packing	
ULRG1	1206	4 - 6 characters	F = ±1%	LF = Pb-free	SLT = Plastic tape	
ULRG15	2010	R = ohms	J = ±5%		All sizes	2000/reel
ULRG2	2512					
ULRG25						
ULRG3						
ULRB1						
ULRB2						

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