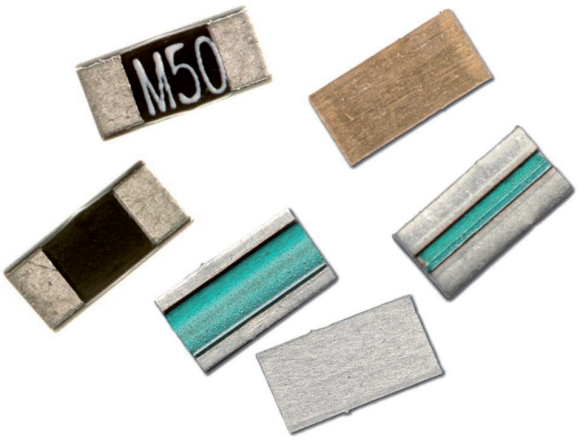
Resistors

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 0.1mΩ to 10mΩ
- Includes anti-sulphur types
- 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	Green Underside	1	0.2, 0.25, 0.3, 0.4, 0.5, 0.6	200	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			
ULR2N	1020		2	1	300			
				1.5, 2, 2.5, 3	170			
ULRG2 / ULR2	2512		2	6.5, 7, 7.5, 8, 9, 10	50			
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			
ULR3N	1225			0.1	500			
				0.2, 0.25, 0.3, 0.4	350			
				0.5	300			
				0.7, 0.75, 0.8, 0.9, 1.0	250			
				1.5, 2.0, 2.5, 3.0	100			
ULRB1 / ULR1	2512	Black	1	0.5, 0.75, 1, 1.5, 2	50		200	
				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	50			
				2.5, 3	150			

Notes: 1. For higher resistance values please refer to LRMA series.

Performance Data

AEC-Q200 Table 7		Method		Max. (add R0005)		
				Black	Green Underside	
ref.	Test[1]				1206 & 2010	1020, 2512 & 1225
3	High Temp. Exposure *	MIL-STD-202 Method 108	ΔR%	1		
4	Temperature Cycling	JESD22 Method JA-104	ΔR%	0.5		1
6	Moisture Resistance	MIL-STD-202 Method 106	ΔR%	1		
7	Biased Humidity	MIL-STD-202 Method 103	ΔR%	1		
8	Operational Life (Cyclic Load) *	MIL-STD-202 Method 108	ΔR%	1		
14	Vibration	MIL-STD-202 Method 204	ΔR%	0.5		1
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		1
22	Terminal Strength	AEC-Q200-006	ΔR%	0.25		1
	Short Term Overload *	5 x Pr for 5s	ΔR%	0.5		1
	Resistance to Sulphur-Bearing Gas[2]	EIA-977	ΔR%	N/A	1	

Notes: 1. Full AEC-Q200 qualification applies to 2512 size. The 1206 and 2010 sizes have received the tests marked *.
2. Resistance to sulphur bearing gas has been tested for green underside construction only.

General Note

TT Electronics reserves the right to make changes in product specification without notice or liability.
All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

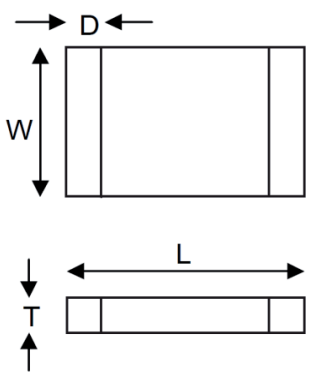
BI Technologies IRC Welwyn

www.ttelectronics.com/resistors

Physical Data

Dimensions(mm) and weight (mg)

Size	Coating	Values	L (±0.25)	W	T (±0.2)	D	Wt (nom)
1206	Green Underside	0.2, 0.25	3.2	1.6 ±0.3	1.0	1.5 ±0.25	25
		0.3, 0.4				1.4 ±0.25	
		0.5, 0.6		1.6 ±0.1	0.6	1.35 ±0.25	20
		0.75				1.23 ±0.25	
		1, 1.2, 3.5, 4, 5, 5.5, 6				1.1 ±0.25	
		2, 2.5, 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		2.54 ±0.15	0.6	2.17 ±0.25	40
		0.75				2.04 ±0.25	
		1, 1.5, 4, 5, 5.5				1.84 ±0.25	
		2, 2.5, 6, 7, 8				1.54 ±0.25	
		3				1.04 ±0.25	
		9, 10				1.29 ±0.25	
1020		1, 1.5, 2, 2.5, 3	2.54	5.08±0.25	0.6	0.57 ±0.25	45
2512		0.15	6.35	3.0 ±0.3	1.0	2.98 ±0.25	60
		0.2				2.88 ±0.25	
		0.25, 0.3				2.68 ±0.25	
		0.4				2.18 ±0.25	
		0.5		3.0 ±0.2	0.6	2.68 ±0.25	
		0.75				2.48 ±0.25	
		1, 5, 5.5, 6				1.93 ±0.25	
		2, 2.5, 3, 3.5, 8, 9, 10				1.18 ±0.25	
		4, 4.5				2.18 ±0.25	
		1.5, 6.5, 7, 7.5				1.43 ±0.25	
1225		0.1, 0.2,	3.0	6.35±0.25	1	1.0±0.25	65
		0.25, 0.3, 0.4			1	0.5±0.25	
		0.5, 0.7, 0.75, 0.8, 0.9, 1.0			0.6	0.5±0.25	
		0.15			0.6	1.0±0.25	
		0.2			0.6	0.8±0.25	
		0.25, 0.30			0.6	0.5±0.25	
2512	Black	0.5	6.35	3.18 ±0.25	1.4	1.3 ±0.38	60
		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	



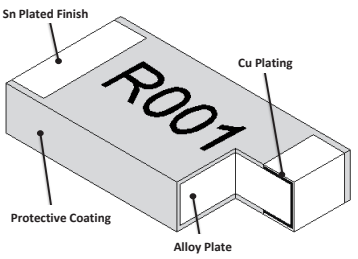
ULR Series

Construction

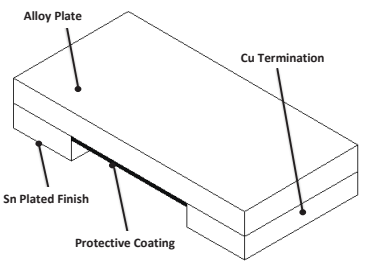
Black Coat
A low TCR resistance alloy plate, with tin plated connection bands is protectively coated on the upper and lower faces and numerically marked with the resistance value. This part is suitable for wave or reflow soldering.

Green Underside Coat
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 black coated 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 Coat

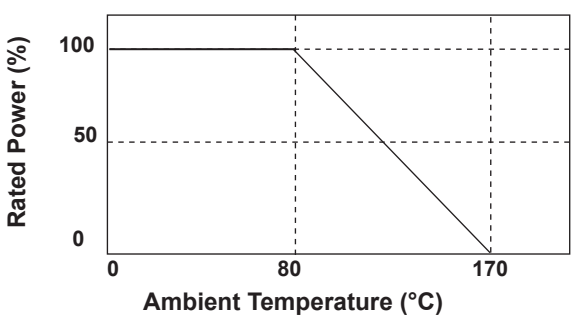


Green Underside Coat

Termination Details:

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

Power Derating Curve

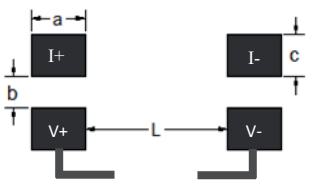


Notes

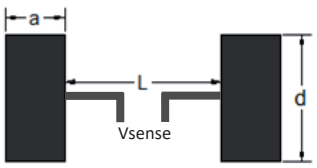
The power derating curve is a guidance based on a conservative design model. The ULR is a solid metal alloy construction that can withstand significantly greater operating temperatures than the conservative model permits. The protective coating will operate up to 260°C and the alloy can withstand in 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.

Recommended Layouts and Measurement Probe Positions

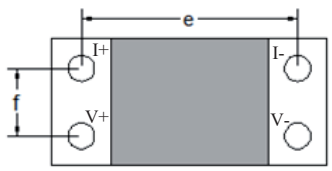
4 pad layout



2 pad layout



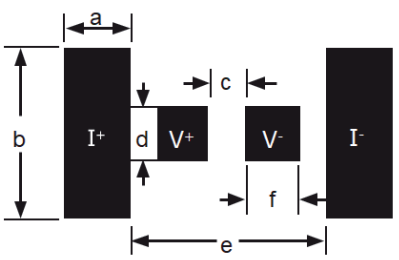
4-wire measurement probe positions



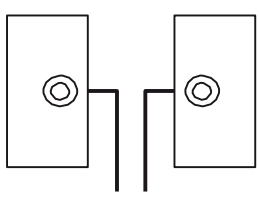
Size	Coating	Values	a	b	c	L	d	e	f
1206	Green Underside	0.5, 0.6, 1, 4 - 6	1.55	0.5	0.7	0.55	1.9	2.6	1.25
		2 - 3, 10	1.05			1.55			
		7 - 9	1.35			0.95			
2010		0.5	2.61	0.8	1.05	0.3	2.9	4.32	1.2
		1, 4 - 5	2.29			0.95			
		2, 6 - 8	1.99			1.55			
		3	1.49			2.55			
		9 - 10	1.74			2.05			
1020		1, 1.5, 2, 2.5, 3	0.925	0.8	2.365	1.04	5.53	2	1.77
2512	Black	All	2.7	1.0	1.2	2.9	3.45	5.4	1.5
2512	Green Underside	0.5	3.13			0.54			
		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			
1225		0.1 - 0.25	1.4	0.8	3.0	0.6	6.8	2.0	2.25
		0.3 - 1.0	0.9			1.6			
		1.5	1.4			0.6			
		2.0	1.2			1.0			
		2.5 - 3.0	0.9			1.6			

Symmetrical Kelvin Connected (4-Wire) Alternatives

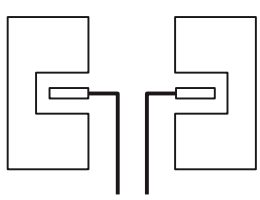
Package	Resistance (mΩ)	a	b	c	d	e	f
1206	0.2 - 0.4	0.75	1.9	0.4	0.6	2.15	0.6
2010	0.2 - 0.4	1.35	2.89	1.4	0.6	3.08	0.6
2512 - Green Underside	0.15 - 0.3	2	3.4	1.0	0.6	2.8	0.6
	0.4	1.5	3.4	2.0	0.6	3.8	0.6



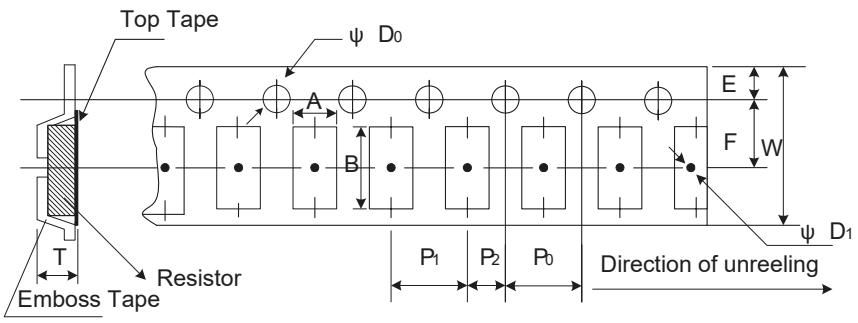
Vias with copper traces on internal layers



Sense traces on solder pads beneath the chip



Packaging



Type	Resistance (mΩ)	A	B	W	E	F	P0	P1	P2	ØD0	ØD0	T	Quantity (EA)
1206	<0.5	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	1.25 ± 0.1	2,000
	≥0.5											0.87 ± 0.1	
2010	<0.5	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	1.5min	1.35 ± 0.1	2,000
	≥0.5											0.85 ± 0.1	
1020	1 - 3												
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
	1.45 ± 0.2											0.81 ± 0.1	
2512 Green Underside	<0.5	3.40 ± 0.1	6.75 ± 0.1	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.05	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	1.5min	1.4 ± 0.1	2,000
	≥0.5											0.8 ± 0.1	
1225	0.1- 0.4	3.40 ± 0.1	6.75 ± 0.1	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.05	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.55 ± 0.05	1.5min	1.2 ± 0.1	2,000
	0.5-3.0											0.80 ± 0.1	

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.

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, ULR1, ULR15S, ULR2N, ULR2, ULR25, ULR3, ULR3N	3 to 6 characters R = ohms	F = ±1%	T2 = Plastic tape	
		J = ±5%	All sizes	2000/reel

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, ULRG15, ULRG2, ULRG25, ULRG3, ULRB1, ULRB2	1206	4 - 6 characters R = ohms	F = ±1%	LF = Pb-free	SLT = Plastic tape	
	2010		J = ±5%		All sizes	2000/reel
	2512					

Mouser Electronics

Authorized Distributor

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TT Electronics:

ULRG22512R010FLFSLT ULRG22512R009FLFSLT ULRG22512R008FLFSLT ULRG22512R007FLFSLT ULRB22512R002FLFSLT ULRB22512R0015FLFSLT ULRB22512R001FLFSLT ULRB12512R003FLFSLT ULRB12512R0005FLFSLT ULRB12512R001FLFSLT ULRB12512R0015FLFSLT ULRB22512R0005FLFSLT ULRB12512R0025FLFSLT ULRB12512R004FLFSLT ULRB12512R005FLFSLT ULRB12512R007FLFSLT ULRB12512R006FLFSLT ULRB12512R002FLFSLT ULRG32512R001FLFSLT ULRG32512R003FLFSLT ULRG32512R0005FLFSLT ULRG252512R004FLFSLT ULRG252512R005FLFSLT ULRG32512R0015FLFSLT ULRG32512R002FLFSLT ULRG32512R0025FLFSLT ULRB22512R00075FLFSLT ULRG252512R0035FLFSLT ULRG32512R00075FLFSLT ULR1S-R002FT2 ULR2-R008FT2 ULR2-R01FT2 ULR3-R0005FT2 ULR1S-R003FT2 ULR1-R001FT2 ULR3-R001FT2 ULR2-R002FT2 ULR1S-R007FT2 ULR1S-R01FT2 ULR3-R0015FT2 ULR15S-R002FT2 ULR2-R0015FT2 ULR1S-R008FT2 ULR1-R006FT2 ULR1S-R005FT2 ULR3-R003FT2 ULR3-R002FT2 ULR1-R005FT2 ULR1-R003FT2 ULR15S-R005FT2 ULR25-R004FT2 ULR1S-R001FT2 ULR25-R006FT2 ULR15S-R006FT2 ULR25-R005FT2 ULR1S-R006FT2 ULR1S-R0055FT2 ULR15S-R004FT2 ULR15S-R0055FT2 ULR1S-R009FT2 ULR15S-R001FT2 ULR2-R001FT2 ULR1-R0025FT2 ULR15S-R01FT2 ULR15S-R002JT2 ULR15S-R003JT2 ULR15S-R005JT2 ULR15S-R007FT2 ULR15S-R007JT2 ULR1S-R001JT2 ULR15S-R0015JT2 ULR15S-R0025FT2 ULR1S-R0035JT2 ULR1S-R0055JT2 ULR2-R003FT2 ULR2-R003JT2 ULR2-R0075FT2 ULR2-R0075JT2 ULR1S-R006JT2 ULR15S-R0025JT2 ULR15S-R0055JT2 ULR1S-R0012FT2 ULR1S-R0012JT2 ULR1S-R0025JT2 ULR1S-R0035FT2 ULR1S-R00075JT2 ULR1S-R004JT2 ULR15S-R0015FT2 ULR1S-R0005FT2 ULR1S-R0006FT2 ULR1S-R00075FT2 ULR1S-R0005JT2 ULR1S-R0006JT2 ULR1-R0065FT2 ULR1-R01FT2 ULR1-R0065JT2 ULR1-R01JT2 ULR2-R007FT2 ULR1-R007FT2 ULR1S-R0025FT2