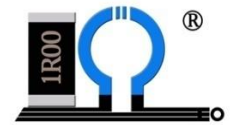


Metal Strip Current Sensing Resistors

PLR Series



■ Features

1. Features

High power rating up to 3 Watts. Low TCR down to $\pm 50\text{PPM}/^{\circ}\text{C}$.

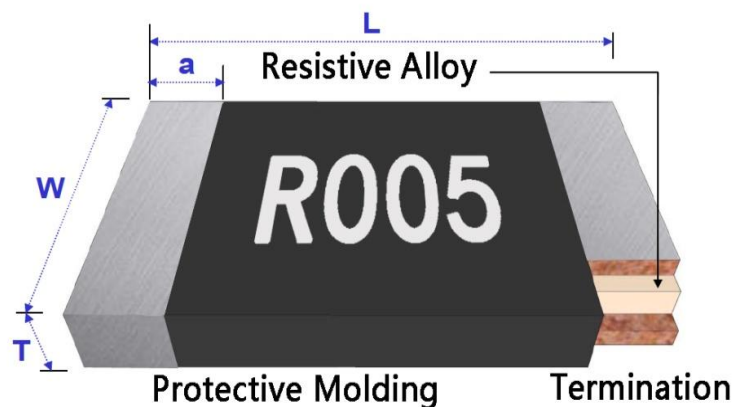
- ★ Low resistance and high precision (1%).
- ★ Low inductance design, less than 1.0nH available.
- ★ Excellent reliability and suitable cost.
- ★ Suitable for lead free soldering.
- ★ High precision trimming implement.
- ★ RoHS compliant & Halogen Free.



■ PART NUMBER

PLR	2512	F	F	R005	T	40	T
PART CODE	SIZE	TOLERANCE	TCR	RESISTANCE	PACKAGING	PACKAGE	POWER
	2512	J= $\pm 5\%$ F= $\pm 1\%$ D= $\pm 0.5\%$ B= $\pm 0.1\%$	F $\pm 50\text{PPM}/^{\circ}\text{C}$ M $\pm 400\text{PPM}/^{\circ}\text{C}$	R010=0.01 Ω R005=0.005 Ω	B=BULK T=TAPING REEL	40=4000PCS	T=3W R=2W

■ DIMENSION

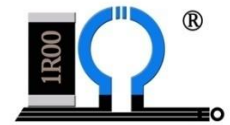


Item	Protective Molding	Resistive Element	Internal Terminal	External Terminal
Material	Resin	Alloy Metal	Copper	Solder

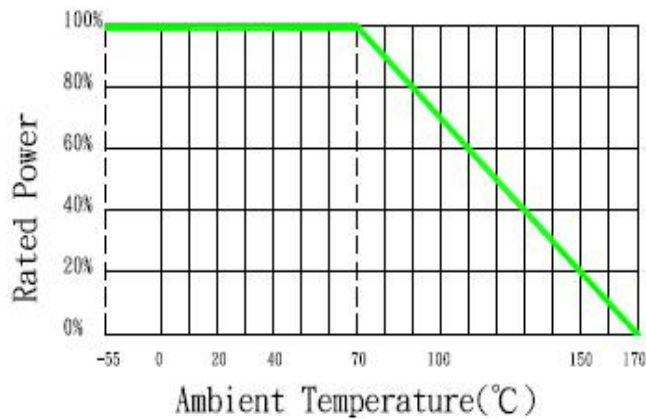
TYPE	L (mm)	W(mm)	T(mm)	a(mm)	
PLR2512	6.40 ± 0.20	3.20 ± 0.20	0.60 ± 0.25	0.90 ± 0.20	

Metal Strip Current Sensing Resistors

PLR Series



■Power Derating Curve



Operating Temperature Range: -55 to +170 deg.C

■Rating

SIZE	Power Rating at 70°C	Max Working Voltage	Max Overload Voltage	Resistance Tolerance (%)	Temperature coefficient of Resistance (ppm/°C)	Resistance
PLR2512	3W /2W	447mV	1000mV	±5%J ±1% F ±0.5% D ±0.1% D	±50	2~680 (mΩ)
						10~500 (mΩ)
PLR2512	3W /2W	447mV	1000mV	±5%J ±1% F ±0.5% D ±0.1% D	±400	1 (mΩ)

(1) $E = P \cdot R$ or Max. Working Voltage whichever is lower.

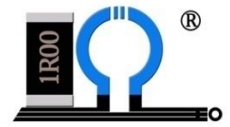
(2) E: Working Voltage(V), P: Rated Power (W), R: Resistance Value(Ω)

(3) Solder-pad and trace size should be >300 mm² and board surface temperature should not exceed 105°C when applying rated power

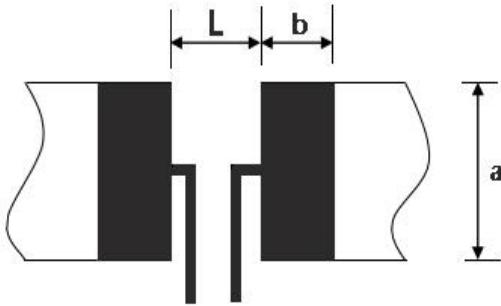
(4) *: TCR Hot (+25~+155°C) only. **: Special requests and details please contact factory.

Metal Strip Current Sensing Resistors

PLR Series

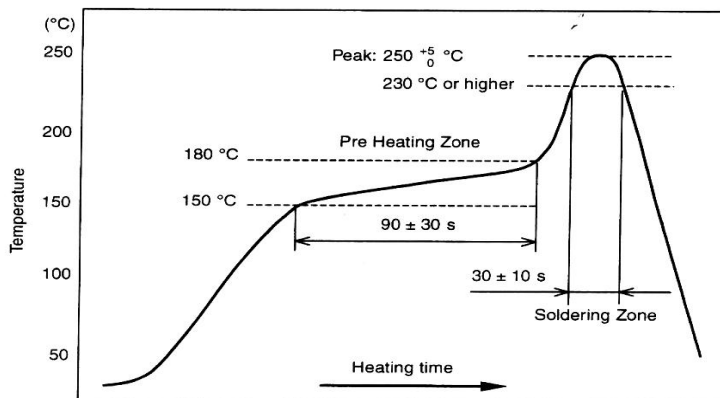


■ Advise Solder plate size



Resistance (mΩ)	a	b	L
$R > 0.004$	4.0mm	2.1mm	4.1mm
$R \leq 0.004$	4.0mm	3.1mm	1.3mm

■ IR - Reflow soldering (weld:Sn96.5/Ag3/Cu0.5)



Peak value: $260 \pm 5 / -0^{\circ}\text{C}$, 5s

Area of preheating: $150 \sim 180^{\circ}\text{C}$, $90 \pm 30\text{s}$

Welding zone: $\geq 230^{\circ}\text{C}$, $30 \pm 10\text{s}$

Soldering iron: $350 \pm 10^{\circ}\text{C}$, $3 \pm 1 / -0\text{s}$

■ Marking

PLR 2512

TOP: Marking. (4 Digits marking to identify the resistance value.)



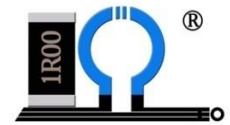
R005=5mΩ R001=1mΩ



R001=1mΩ

Metal Strip Current Sensing Resistors

PLR Series



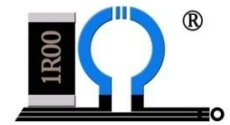
Reliability Performance (AEC-Q200)

* Normal test items for standard product.

Test Item	Specification	Test Method (AEC-Q200. IEC 60115)
*DC Resistance	F: $\pm 1\%$ 、G: $\pm 2\%$ 、J: $\pm 5\%$	AEC-Q200 TABLE 7.1 IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value.
High Temperature Exposure (Storage)	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	AEC-Q200 TABLE 7.3 1000 hrs. @ T=125°C. Unpowered. Measurement at 24 ± 2 hours after test conclusion.
*Temperature Cycling	J、G: $\Delta R \leq \pm(1\%+1m\Omega)$ F: $\Delta R \leq \pm(0.5\%+1m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.4 1000 Cycles (-55°C to +125°C). Measurement at 24 ± 2 hours after test conclusion.
Moisture Resistance	J、G: $\Delta R \leq \pm(1\%+0.5m\Omega)$ F: $\Delta R \leq \pm(0.5\%+0.5m\Omega)$	AEC-Q200 TABLE 7.6 Test 65°C/80~100%RH/10Cycles. Measurement at 24 ± 2 hours after test conclusion. (t=24hrs/cycle)
Biased Humidity	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	AEC-Q200 TABLE 7.7 1000 hours 85°C/85%RH. 10% of operating power. Measurement at 24 ± 2 hours after test conclusion.
Operational Life	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	AEC-Q200 TABLE 7.8 Test 1000hr @ TA=125°C at specified rated power. Measurement at 24 ± 2 hours after test conclusion.
External Visual	No visual damage and refer PDC marking code.	AEC-Q200 TABLE 7.9 Inspect device construction, marking and workmanship.
Physical Dimension	Within the spec.	AEC-Q200 TABLE 7.10 Verify physical dimensions to the applicable device detail specification.
Mechanical Shock	Within product specification tolerance and no visible damage.	AEC-Q200 TABLE 7.13 Test Peak value:100g's,Wave:Hail-sine, Duration:6ms,Velocity:12.3ft/sec.

Metal Strip Current Sensing Resistors

PLR Series

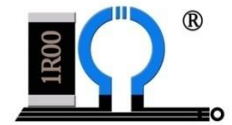


Vibration	No mechanical damage.	AEC-Q200 TABLE 7.14 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000 Hz
*Resistance to Solder Heat	J、G: $\Delta R \leq \pm(1\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.15 Solder dipping @ 270°C±5°C for 10sec.±1sec.
Thermal Shock	J、G: $\Delta R \leq \pm(1\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.16 -55 to 155°C/ dwell time 15min/ Max transfer time 20sec/ 300cycles
ESD	$\Delta R \leq \pm(1\% + 0.5m\Omega)$ No mechanical damage.	AEC-Q200-002 Test contact min. 1KV.
*Solder Ability	Over 95% of termination must be covered with solder.	AEC-Q200 TABLE 7.18 a) Baking 155°C 4H, dipping 235°C 5s b) Steam 1H, dipping 215°C 5s c) Steam 1H, dipping 260°C 7s

Flammability	Refer UL-94.	AEC-Q200 TABLE 7.20 UL-94 V-0 or V-1 are acceptable
*Board Flex	J、G: $\Delta R \leq \pm(1\% + 1m\Omega)$ F: $\Delta R \leq \pm(0.5\% + 1m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.21 Bending 2mm 5931.2512.1206
Terminal Strength	No mechanical damage	AEC-Q200 TABLE 7.22 Force 1 Kg for 60 seconds.
*Short Time Overload	J、G: $\Delta R \leq \pm(2\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(1\% + 0.5m\Omega)$	IEC 60115-1, Clause 4.13 5 × Rated power for 5 seconds
*Load Life Humidity	J、G: $\Delta R \leq \pm(3\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(1\% + 0.5m\Omega)$	IEC 60115-1, Clause 4.24 40±2°C with relative humidity 90% ~ 95% D.C. rated voltage for 1.5 hours ON 30 minutes OFF. Cycle repeated 1000 hours.
*Temperature Coefficient of Resistance (TCR)	Within the spec.	IEC 60115-1, Clause 4.8 $T_1 T_2$ Test temperature: 25°C ~ -55°C 25°C ~ +155°C $TCR(ppm/^\circ C) =$ $(R_2 - R_1) / R_1 \times 1 / (T_2 - T_1) \times 10^6$

Metal Strip Current Sensing Resistors

PLR Series



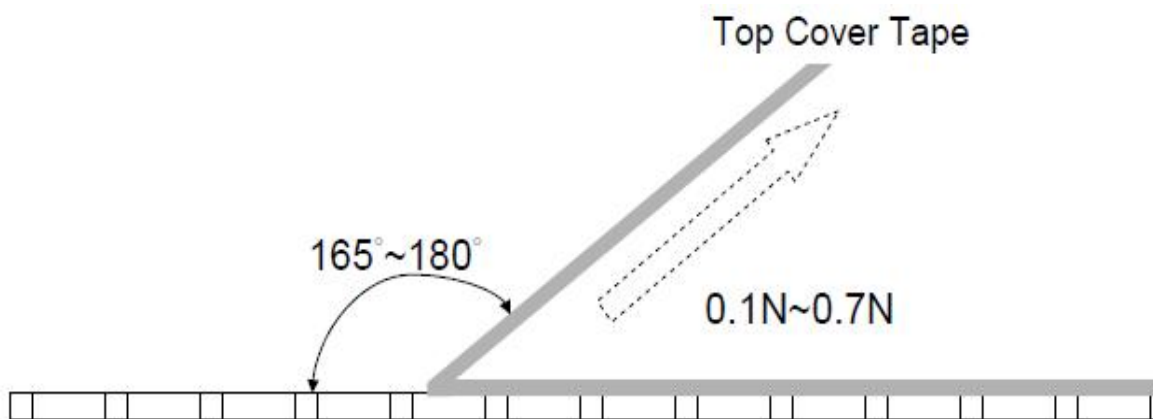
*Load Life	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	IEC 60115-1, Clause 4.25 Rated voltage for 1.5 hours for followed by a pause 0.5 hour at $70\pm 2^{\circ}\text{C}$. Cycle repeated 1000 hours.
*Insulation Resistance	Between termination and coating must over $1000M\Omega$	IEC 60115-1, Clause 4.6 Test voltage: $100\pm 15\text{V}$

PACKAGING

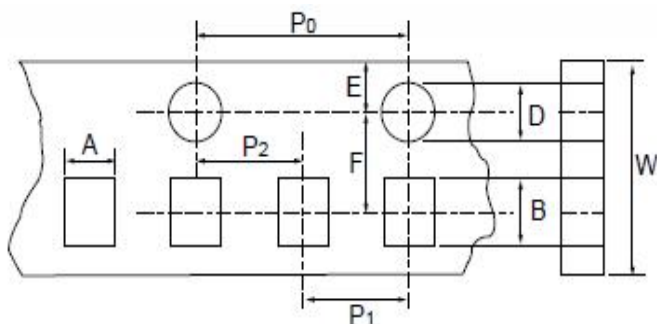
Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

The peel force of top cover tape shall between 0.1 to 0.7N



Tape Packaging Dimensions



• Accumulated dimensional tolerance $40\pm 0.2\text{mm}$

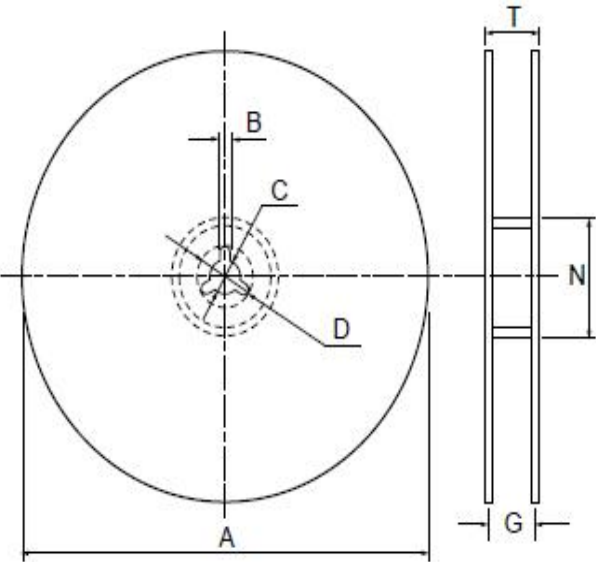
Size	A	B	W	F	E	P1	P2	P0	D
2512	3.6 ± 0.2	6.90 ± 0.2	12 ± 0.30	5.5 ± 0.05	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	4.0 ± 0.1	1.50 ± 0.10

Metal Strip Current Sensing Resistors

PLR Series



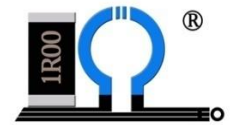
Reel Dimensions



SIZE	A	B	N	C	T
PLR2512	180mm±2.0	2.0mm±0.5	60mm±1.0	13mm±1.0	15.4mm±2.0

Metal Strip Current Sensing Resistors

PLR Series



■ Features

1. Features

High power rating up to 3 Watts. Low TCR down to $\pm 50\text{PPM}/^{\circ}\text{C}$.

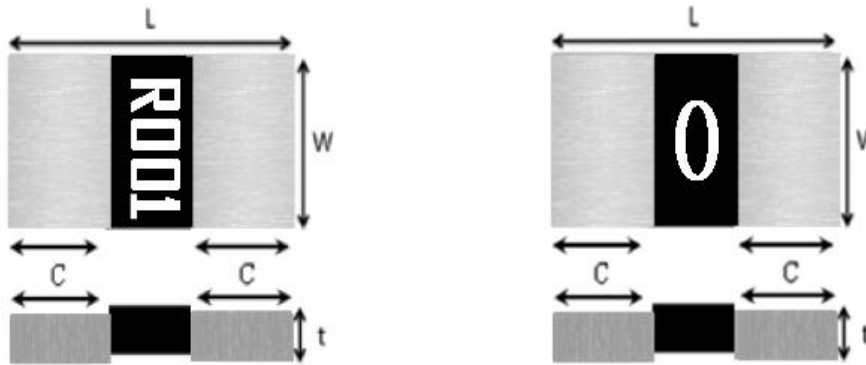
- ★ Low resistance and high precision (1%).
- ★ Low inductance design, less than 1.0nH available.
- ★ Excellent reliability and suitable cost.
- ★ Suitable for lead free soldering.
- ★ High precision trimming implement.
- ★ RoHS compliant & Halogen Free.



■ PART NUMBER

PLR	2512	F	G	R001	T	40	T
PART CODE	SIZE	TOLERANCE	TCR	RESISTANCE	PACKAGING	PACKAGE	POWER
	2512	J=±5% F=±1% D=±0.5% B=±0.1%	F±50PPM/°C G±100PPM/°C M±400PPM/°C - =jumper	R001=0.001Ω 0R00=0Ω	B=BULK T= TAPING REEL	40=4000PCS	T=3W R=2W

■ DIMENSION

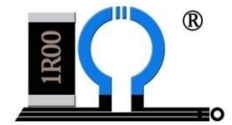


Item	Protective Molding	Resistive Element	Internal Terminal	External Terminal
Material	Resin	Alloy Metal	Copper	Solder

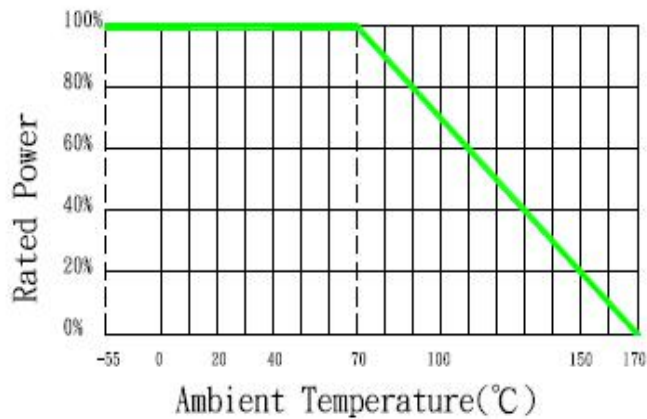
TYPE	L (mm)	W(mm)	C(mm)	t(mm)	
PLR2512	6.40±0.20	3.20±0.20	2.00±0.2	0.75±0.20	

Metal Strip Current Sensing Resistors

PLR Series



■Power Derating Curve



Operating Temperature Range: -55 to +170 deg.C

■Rating

SIZE	Power Rating at 70℃	Max Working Voltage	Max Overload Voltage	Resistance Tolerance (%)	Temperature coefficient of Resistance (ppm/℃)	Resistance
PLR2512	3W /2W	447mV	1000mV	±1% F ±5% J	-	0 (mΩ)
PLR2512	3W /2W	447mV	1000mV	±5%J ±1% F ±0.5% D ±0.1% D	±50	2、3、4(mΩ)
PLR2512	3W /2W	447mV	1000mV	±5%J ±1% F ±0.5% D ±0.1% D	±100	1.5、1、0.75(mΩ)
PLR2512	3W /2W	447mV	1000mV	±5%J ±1% F ±0.5% D ±0.1% D	±400	0.5(mΩ)

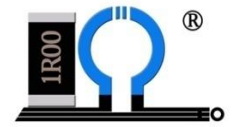
(2) E: Working Voltage(V), P: Rated Power (W), R: Resistance Value(Ω)

(3) Solder-pad and trace size should be >300 mm² and board surface temperature should not exceed 105℃ when applying rated power

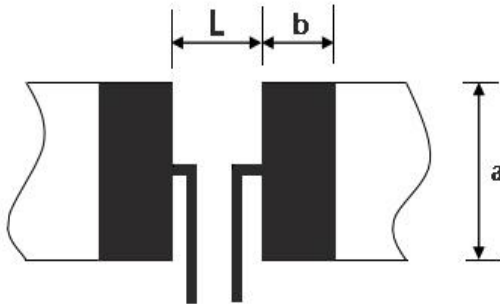
(4) *: TCR Hot (+25~+155℃) only. **: Special requests and details please contact factory.

Metal Strip Current Sensing Resistors

PLR Series

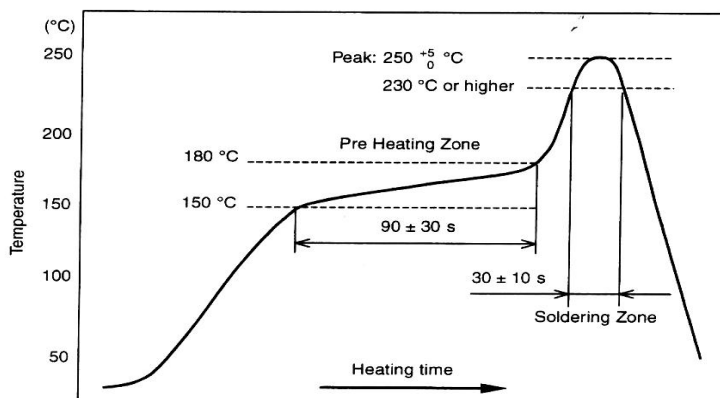


■ Advise Solder plate size



Resistance (mΩ)	a	b	L
1、 0	3.2mm	2.0mm	2.4mm

■ IR - Reflow soldering (weld:Sn96.5/Ag3/Cu0.5)



Peak value: $260 \pm 5/-0^\circ\text{C}$, 5s

Area of preheating: $150 \sim 180^\circ\text{C}$, $90 \pm 30\text{s}$

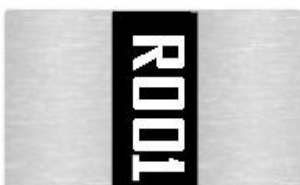
Welding zone: $\geq 230^\circ\text{C}$, $30 \pm 10\text{s}$

Soldering iron: $350 \pm 10^\circ\text{C}$, $3 \pm 1/-0\text{s}$

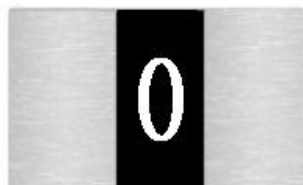
■ Marking

PLR 2512

TOP: Marking. (4 Digits marking to identify the resistance value.)



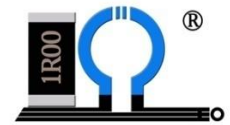
R001=1mΩ



0=0mΩ

Metal Strip Current Sensing Resistors

PLR Series



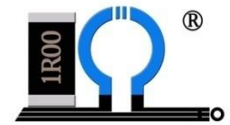
Reliability Performance (AEC-Q200)

* Normal test items for standard product.

Test Item	Specification	Test Method (AEC-Q200. IEC 60115)
*DC Resistance	F: $\pm 1\%$ 、G: $\pm 2\%$ 、J: $\pm 5\%$	AEC-Q200 TABLE 7.1 IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value.
High Temperature Exposure (Storage)	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	AEC-Q200 TABLE 7.3 1000 hrs. @ T=125°C. Unpowered. Measurement at 24 ± 2 hours after test conclusion.
*Temperature Cycling	J、G: $\Delta R \leq \pm(1\%+1m\Omega)$ F: $\Delta R \leq \pm(0.5\%+1m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.4 1000 Cycles (-55°C to +125°C). Measurement at 24 ± 2 hours after test conclusion.
Moisture Resistance	J、G: $\Delta R \leq \pm(1\%+0.5m\Omega)$ F: $\Delta R \leq \pm(0.5\%+0.5m\Omega)$	AEC-Q200 TABLE 7.6 Test 65°C/80~100%RH/10Cycles. Measurement at 24 ± 2 hours after test conclusion. (t=24hrs/cycle)
Biased Humidity	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	AEC-Q200 TABLE 7.7 1000 hours 85°C/85%RH. 10% of operating power. Measurement at 24 ± 2 hours after test conclusion.
Operational Life	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	AEC-Q200 TABLE 7.8 Test 1000hr @ TA=125°C at specified rated power. Measurement at 24 ± 2 hours after test conclusion.
External Visual	No visual damage and refer PDC marking code.	AEC-Q200 TABLE 7.9 Inspect device construction, marking and workmanship.
Physical Dimension	Within the spec.	AEC-Q200 TABLE 7.10 Verify physical dimensions to the applicable device detail specification.
Mechanical Shock	Within product specification tolerance and no visible damage.	AEC-Q200 TABLE 7.13 Test Peak value:100g's,Wave:Hail-sine, Duration:6ms,Velocity:12.3ft/sec.

Metal Strip Current Sensing Resistors

PLR Series

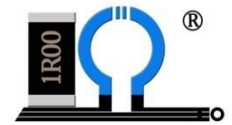


Vibration	No mechanical damage.	AEC-Q200 TABLE 7.14 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000 Hz
*Resistance to Solder Heat	J、G: $\Delta R \leq \pm(1\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.15 Solder dipping @ 270°C±5°C for 10sec.±1sec.
Thermal Shock	J、G: $\Delta R \leq \pm(1\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.16 -55 to 155°C/ dwell time 15min/ Max transfer time 20sec/ 300cycles
ESD	$\Delta R \leq \pm(1\% + 0.5m\Omega)$ No mechanical damage.	AEC-Q200-002 Test contact min. 1KV.
*Solder Ability	Over 95% of termination must be covered with solder.	AEC-Q200 TABLE 7.18 a) Baking 155°C 4H, dipping 235°C 5s b) Steam 1H, dipping 215°C 5s c) Steam 1H, dipping 260°C 7s

Flammability	Refer UL-94.	AEC-Q200 TABLE 7.20 UL-94 V-0 or V-1 are acceptable
*Board Flex	J、G: $\Delta R \leq \pm(1\% + 1m\Omega)$ F: $\Delta R \leq \pm(0.5\% + 1m\Omega)$ No mechanical damage.	AEC-Q200 TABLE 7.21 Bending 2mm 5931.2512.1206
Terminal Strength	No mechanical damage	AEC-Q200 TABLE 7.22 Force 1 Kg for 60 seconds.
*Short Time Overload	J、G: $\Delta R \leq \pm(2\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(1\% + 0.5m\Omega)$	IEC 60115-1, Clause 4.13 5 × Rated power for 5 seconds
*Load Life Humidity	J、G: $\Delta R \leq \pm(3\% + 0.5m\Omega)$ F: $\Delta R \leq \pm(1\% + 0.5m\Omega)$	IEC 60115-1, Clause 4.24 40±2°C with relative humidity 90% ~ 95% D.C. rated voltage for 1.5 hours ON 30 minutes OFF. Cycle repeated 1000 hours.
*Temperature Coefficient of Resistance (TCR)	Within the spec.	IEC 60115-1, Clause 4.8 $T_1 T_2$ Test temperature: 25°C ~ -55°C 25°C ~ +155°C $TCR(ppm/^\circ C) = (R_2 - R_1) / R_1 \times 1 / (T_2 - T_1) \times 10^6$

Metal Strip Current Sensing Resistors

PLR Series



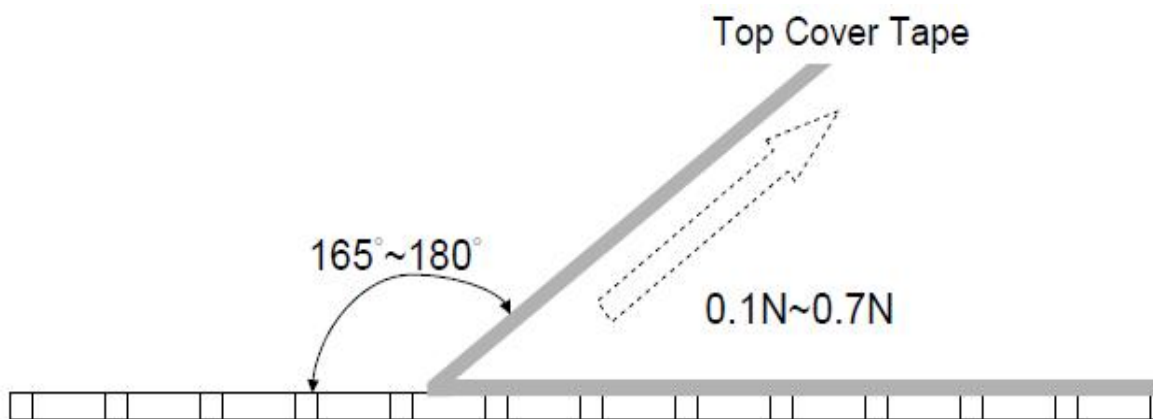
*Load Life	J、G: $\Delta R \leq \pm(3\%+0.5m\Omega)$ F: $\Delta R \leq \pm(1\%+0.5m\Omega)$	IEC 60115-1, Clause 4.25 Rated voltage for 1.5 hours for followed by a pause 0.5 hour at $70\pm2^{\circ}\text{C}$. Cycle repeated 1000 hours.
*Insulation Resistance	Between termination and coating must over $1000M\Omega$	IEC 60115-1, Clause 4.6 Test voltage: $100\pm15V$

PACKAGING

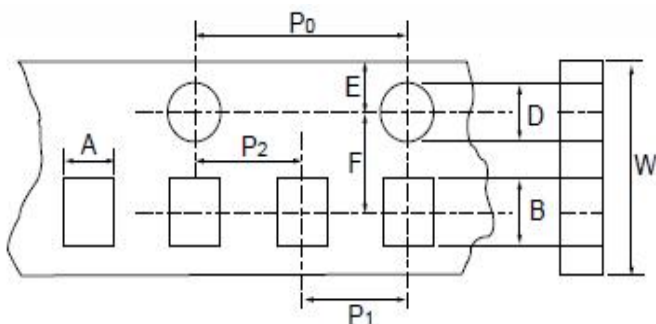
Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

The peel force of top cover tape shall between 0.1 to 0.7N



Tape Packaging Dimensions



• Accumulated dimensional tolerance $40\pm0.2\text{mm}$

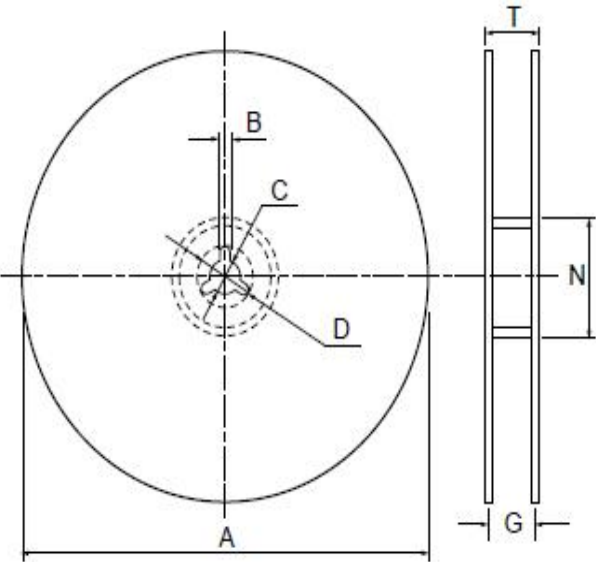
Size	A	B	W	F	E	P1	P2	P0	D
2512	3.5 ± 0.2	6.80 ± 0.2	12 ± 0.30	5.5 ± 0.05	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	4.0 ± 0.1	1.50 ± 0.10

Metal Strip Current Sensing Resistors

PLR Series



Reel Dimensions



SIZE	A	B	N	C	T
PLR2512	180mm±2.0	2.0mm±0.5	60mm±1.0	13mm±1.0	15.4mm±2.0