



Current Sensing Resistors / 电流感测电阻器

- **Chip Current Sensing Resistors - CS Series / 贴片电流感测电阻 ----- 1**
- **Thin Film Current Sensing Chip Resistors - TCS Series / 薄膜电流感测贴片电阻 -- 6**
- **Low Resistance Low Inductance Power Resistors - BWL Series / 低感低阻电阻 -- 11**
- **Low Ohmic/Value Resistors - Open Air - LRA Series / 引脚电阻 ----- 13**
- **Open Air Resistors / Current Sense - LRB Series / 压脚电阻 ----- 15**
- **Current Sensing Resistor (SMD) - LRC Series / 贴片低阻电阻 ----- 16**

Notice: Specification Changed or Version Updated will be posted at irregular intervals.
All Updated and Final Specifications, Please Confirm with TOKEN ELECTRONICS REPRESENTATIVES.



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Current Sensing Resistors

Chip Current Sensing Resistors - CS Series

► Chip Current Sensing Resistor Features

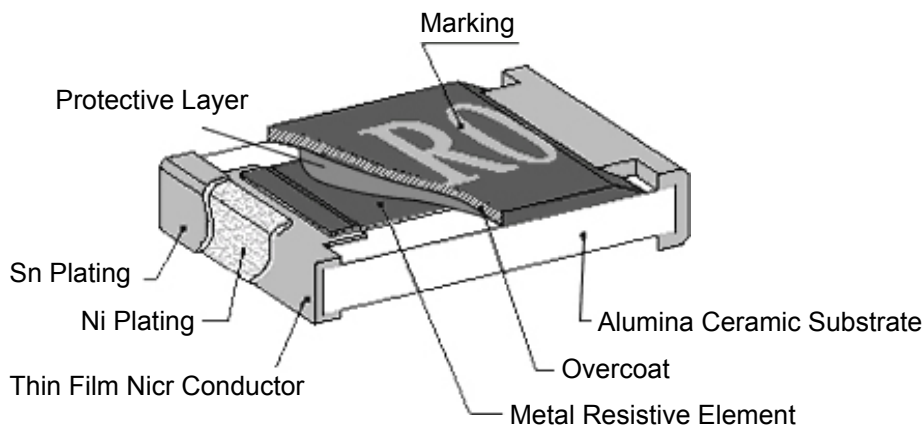
- 3W Rating in 1W size, 1225 Package
- Low TCR from ± 100 PPM \sim ± 600 PPM/ $^{\circ}$ C
- Resistance Values from 1 to 1000m ohms
- High Purity Alumina Substrate for High Power Dissipation
- Products with Pb-free Terminations Meet RoHS Requirements

► Chip Current Sensing Resistor Applications

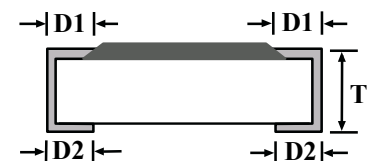
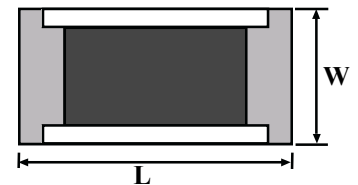
- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Application
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver
- Portable Devices (PDA, Cell phone)



► Chip Current Sensing Resistor Construction



0402/0603/0805/1206/2010/2512



1225/3720/7520



► Chip Current Sensing Resistor Dimensions (Unit: mm)

Type	L	W	T	D1	D2
CS02 (0402)	1.00 \pm 0.05	0.50 \pm 0.05	0.32 \pm 0.10	0.25 \pm 0.10	0.20 \pm 0.10
CS03 (0603)	1.60 \pm 0.10	0.80 \pm 0.10	0.45 \pm 0.10	0.30 \pm 0.20	0.30 \pm 0.20
CS05 (0805)	2.00 \pm 0.15	1.25 \pm 0.15	0.55 \pm 0.10	0.30 \pm 0.20	0.40 \pm 0.25
CS06 (1206)	3.05 \pm 0.15	1.55 \pm 0.15	0.55 \pm 0.10	0.50 \pm 0.30	0.40 \pm 0.25
CS10 (2010)	5.00 \pm 0.20	2.45 \pm 0.15	0.60 \pm 0.15	0.60 \pm 0.30	0.50 \pm 0.25
CS12 (2512)	6.35 \pm 0.20	3.15 \pm 0.15	0.60 \pm 0.10	0.60 \pm 0.30	0.55 \pm 0.25
CS25 (1225)	3.10 \pm 0.15	6.30 \pm 0.15	0.90 \pm 0.15	0.60 \pm 0.30	0.55 \pm 0.25
CS37 (3720)	2.00 \pm 0.20	3.75 \pm 0.20	0.60 \pm 0.10	0.40 \pm 0.20	0.40 \pm 0.20
CS75 (7520)	2.00 \pm 0.20	7.50 \pm 0.30	0.60 \pm 0.10	0.40 \pm 0.20	0.40 \pm 0.20



Current Sensing Resistors

► Chip Current Sensing Resistor Standard Electrical Specifications

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
CS02 (0402)	1/16W	-55 ~ +155°C	±1% ±2% ±5%	50mΩ~100mΩ	±400
CS03 (0603)	1/10W			101mΩ~500mΩ	±300
CS05 (0805)	1/8W			501mΩ~1Ω	±200
CS06 (1206)	1/4W			20mΩ~50mΩ	±600
CS10 (2010)	3/4W			51mΩ~100mΩ	±400
CS12 (2512)	1W			101mΩ~500mΩ	±300
CS25 (1225)	3W			501mΩ~1Ω	±200
				3mΩ~5mΩ	±300
				6mΩ~20mΩ	±200
				21mΩ~30mΩ	±150
CS37 (3720)	1W			31mΩ~200mΩ	±100
CS75 (7520)	2W			10mΩ~19mΩ	±300
		20mΩ~500mΩ	±150		
CS75 (7520)	2W	±2%,±5%	1mΩ~4mΩ	±300	
		±1%,±2%,±5%	5mΩ~10mΩ	±200	
CS75 (7520)	2W	±1%,±2%,±5%	11mΩ~350mΩ	±150	

Note:Token has the ability to manufacture following options based on customer's requirement.

► Chip Current Sensing Resistors - High Power Rating Electrical Specifications

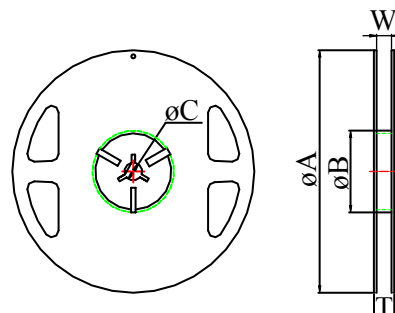
Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range
CS05***V****	1/4W	-55 ~ +155°C	±1% ±2% ±5%	100mΩ~1Ω
CS06***U****	1/2W			100mΩ~1Ω
CS10***T****	1W			100mΩ~1Ω
CS12***A****	1.5W			100mΩ~1Ω

► Chip Current Sensing Resistors - Low TCR (±100ppm) Electrical Specifications

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range
CS06**EV****	1/4W	-55 ~ +155°C	±1% ±2% ±5%	100mΩ~1Ω
CS10**EQ****	3/4W			100mΩ~1Ω
CS12**ET****	1W			100mΩ~1Ω
CS75**ES****	2W			1mΩ~5mΩ

► Chip Current Sensing Resistors - Marking for 0603

Marking	Value
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
<u>101</u>	0.101Ω
<u>035</u>	0.035Ω



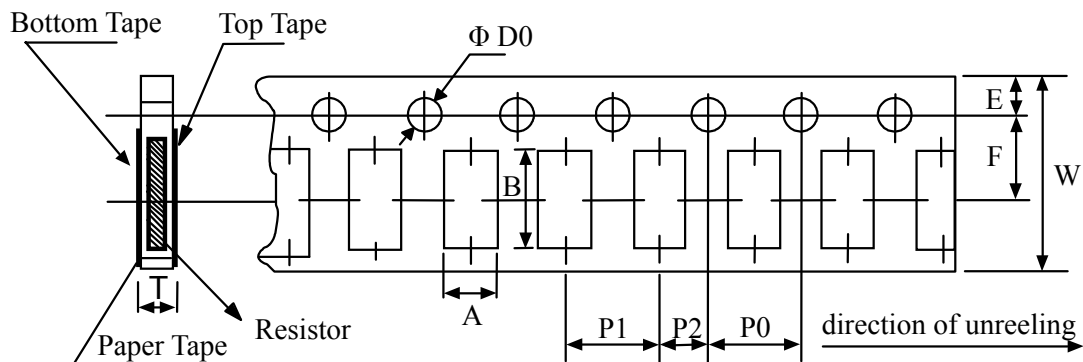


Current Sensing Resistors

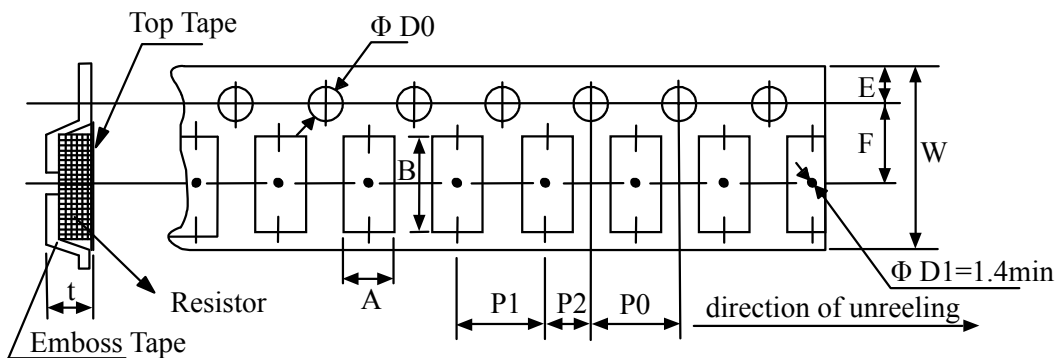
► Chip Current Sensing Resistor Packaging Quantity & Reel Specifications (Unit: mm)

Type	ΦA	ΦB	ΦC	W	T	Paper Tape	Emboss Plastic Tape
CS02	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	10,000	-
CS03	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
CS05	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
CS06	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
CS10	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	4,000
CS12	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	4,000
CS25	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	2,000
CS37	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	4,000
CS75	178±1	60.2±0.5	13.0±0.50	17.0±0.50	19.0±1.00	-	4,000

► Chip Current Sensing Resistor Paper Tape Specifications (Unit: mm)



Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
CS02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
CS03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
CS05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
CS06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

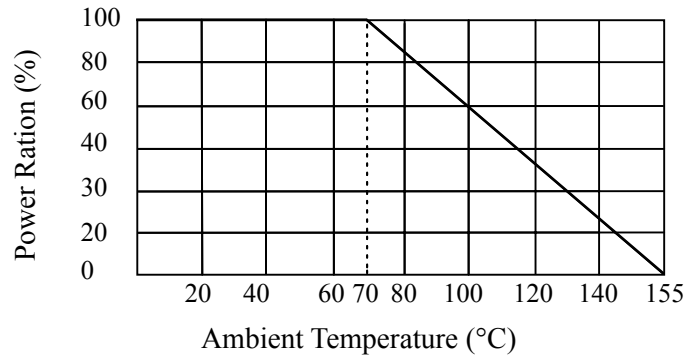


Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
CS10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS25	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CS37	2.50±0.20	4.45±0.20	12.0±0.30	1.75±0.01	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.50±0.10
CS75	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.01	7.8±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.50±0.10





Current Sensing Resistors



► Chip Current Sensing Resistor Environmental Characteristics

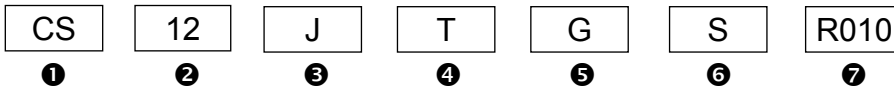
Item	Specification	Test Method
Temperature Coefficient of Resistance	As Spec	MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C
Short Time Overload	$\pm(0.5\% + 0.05\Omega)$	JIS-C-5202-5.5
	$\Delta R \pm 1\%$ for high power rating	RCWV*2.5 or Max Overloading Voltage 5seconds
Dielectric Withstand Voltage	by Type	MIL-STD-202F Method 301 Apply Max Overload Voltage for 1 minute
Insulation Resistance	>1000M Ω	MIL-STD-202F Method 302 Apply 100VDC for 1minute
Thermal Shock	$\pm(0.5\% + 0.05\Omega)$	MIL-STD-202F Method 107G -55°C~150°C, 100cycles
Load Life	$\pm(1\% + 0.05\Omega)$	MIL-STD-202F Method 108A RCWV, 70°C, 1.5 hours on , 0.5 hours off , 1000~1048 hours
humidity (Steady State)	$\pm(0.5\% + 0.05\Omega)$	MIL-STD-202F Method 103B 40°C, 90~95%RH, RCWV 1.5 hours ON, 0.5 hours OFF, total 1000 ~ 1048 hours
Resistance to dry heat	$\pm(0.5\% + 0.05\Omega)$	JIS-C-5202-7.2 96hours @ +155°C without load
Low Temperature Operation	$\pm(0.5\% + 0.05\Omega)$	JIS-C-5202-7.1 1hour, -65°C followed by 45minutes of RCWV
Bending Strength	As Spec	JIS-C-5202-6.1.4 Bending Amplitude 3mm for 10seconds
Solderability	95%min coverage	MIL-STD-202F Method 208H 260°C \pm 5°C, 2 \pm 0.5 (sec)
Resistance to Soldering Heat	$\pm(0.5\% + 0.05\Omega)$	MIL-STD-202F Method 210E 260 \pm 5°C, 10 \pm 1 second

Note: Storage Temperature: 25 \pm 3°C; Humidity: <80%RH



Current Sensing Resistors

► Chip Current Sensing Resistor How to Order



① Product Type

② Dimensions (L×W)

Code	Dimensions (L×W)
02 (0402)	1.00×0.50mm
03 (0603)	1.60×0.80mm
05 (0805)	2.00×1.25mm
06 (1206)	3.10×1.55mm
10 (2010)	5.00×2.50mm
12 (2512)	6.30×3.10mm
25 (1225)	3.10×6.30mm
37 (3720)	3.75×2.00mm
75 (7520)	7.50×2.00mm

③ Resistance Tolerance

Code	Resistance Tolerance
J	±5%
H	±3%
G	±2%
F	±1%

④ Packaging

Code	Packaging
T	Taping Reel
P	Bulk

⑤ TCR

Code	TCR
E	±100ppm/°C
K	±150ppm/°C
F	±200ppm/°C
G	±300ppm/°C
H	±400ppm/°C
I	±500ppm/°C
J	±600ppm/°C

⑥ Power Rating

Code	Power Rating
R	3W
S	2W
A	1.5W
T	1W
Q	3/4W
U	1/2W
V	1/4W
W	1/8W
X	1/10W
Y	1/16W
Z	1/32W

⑦ Resistance

Code	Resistance
1R00	1.000Ω
R100	0.100Ω
R050	0.050Ω
R015	0.015Ω
R010	0.010Ω
R001	0.001Ω



Current Sensing Resistors

Thin Film Current Sensing Chip Resistors - TCS Series

► Features

- Thin Film Process
- Very Tight Tolerance from $\pm 0.5\% \sim \pm 1\%$
- Extremely Low TCR from $\pm 50 \sim \pm 200$ PPM/ $^{\circ}\text{C}$
- Resistance Values from 50m to 999m ohms
- High Purity Alumina Substrate for High Power Dissipation
- Products with Pb-free Terminations Meet RoHS Requirements

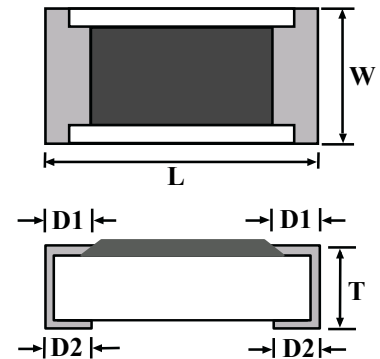
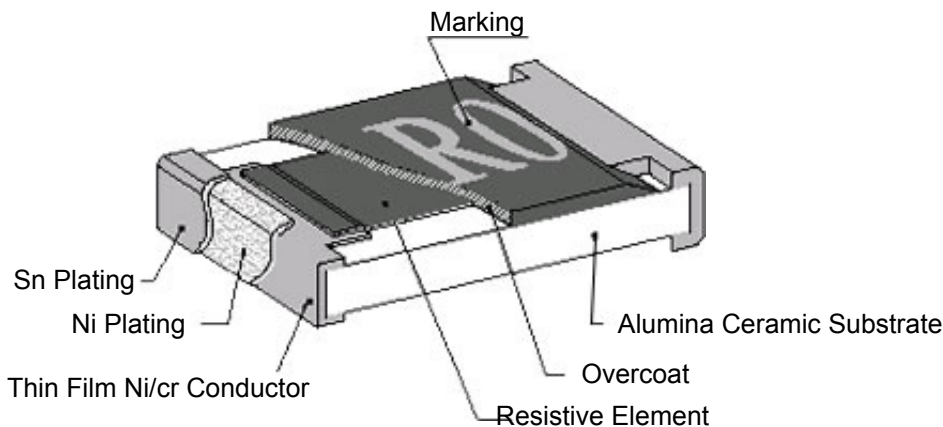
► Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Application
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver
- Portable Devices (PDA, Cell phone)



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► Chip Current Sensing Resistor Construction



► Dimensions (Unit: mm)

Type	L	W	T	D1	D2
TCS02	1.00 \pm 0.05	0.50 \pm 0.05	0.32 \pm 0.10	0.25 \pm 0.10	0.20 \pm 0.10
TCS03	1.60 \pm 0.10	0.80 \pm 0.10	0.45 \pm 0.10	0.30 \pm 0.20	0.30 \pm 0.20
TCS05	2.00 \pm 0.15	1.25 \pm 0.15	0.55 \pm 0.10	0.30 \pm 0.20	0.40 \pm 0.25
TCS06	3.05 \pm 0.15	1.55 \pm 0.15	0.55 \pm 0.10	0.50 \pm 0.30	0.40 \pm 0.25
TCS10	5.00 \pm 0.20	2.45 \pm 0.15	0.60 \pm 0.15	0.60 \pm 0.30	0.50 \pm 0.25
TCS12	6.35 \pm 0.20	3.15 \pm 0.15	0.60 \pm 0.10	0.60 \pm 0.30	0.55 \pm 0.25



Current Sensing Resistors

► Standard Electrical Specifications - Current Sensing Chip Resistors

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
TCS02 (0402)	1/16W	-55 ~ +155°C	±0.5% ±1.0%	500mΩ~999mΩ	±100 ±50
TCS03 (0603)	1/10W		±0.5% ±1.0%	200mΩ~300mΩ 301mΩ~999mΩ	±100 ±50
TCS05 (0805)	1/8W		±1.0%	50mΩ~100mΩ	±200 ±100 ±50
TCS06 (1206)	1/4W		±0.5% ±1.0%	101mΩ~300mΩ 301mΩ~999mΩ	±200 ±100 ±50
TCS10 (2010)	3/4W		±0.5% ±1.0%	50mΩ~100mΩ 101mΩ~300mΩ 301mΩ~999mΩ	±200 ±100 ±50
TCS12 (2512)	1W		±0.5% ±1.0%		

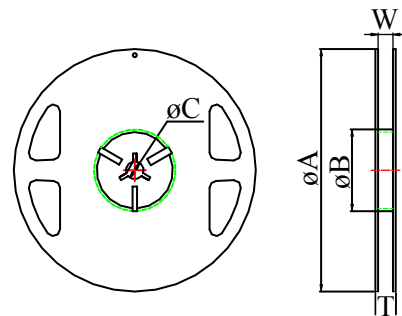
Note:Token has the ability to manufacture following options based on customer's requirement.

► High Power Rating Electrical Specifications

Type	Power Rating at 70°C	Operating Temp. Range	Resistance Tolerance	Resistance Range	TCR (PPM/°C)
TCS12 (2512)	3W	-55 ~ +155°C	±1.0%	100mΩ~1Ω	±100

► Chip Current Sensing Resistor Marking for 0603

Marking	Value
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
<u>101</u>	0.101Ω
<u>035</u>	0.035Ω



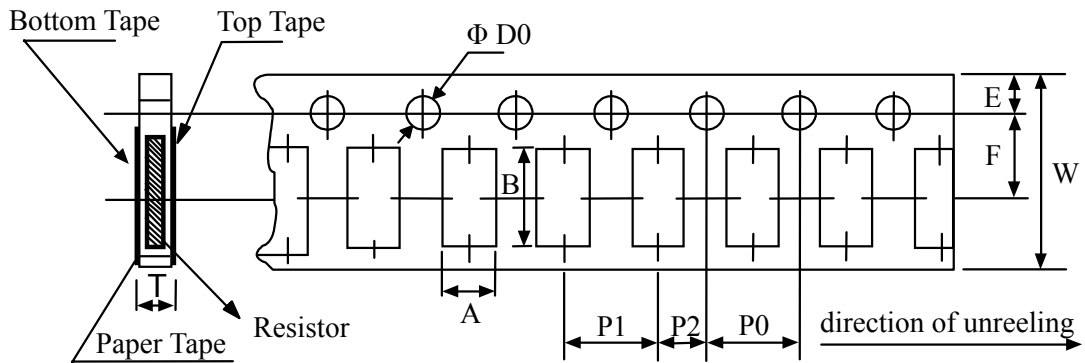
► Packaging Quantity & Reel Specifications (Unit: mm)

Type	ΦA	ΦB	ΦC	W	T	Paper Tape	Emboss Plastic Tape
TCS02	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	10,000	-
TCS03	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS05	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS06	178±1	60.0+0.5	13.0±0.20	9.00±0.50	12.0±0.15	5,000	-
TCS10	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	4,000
TCS12	178±1	60.2±0.5	13.0±0.50	13.2±1.50	16.0±0.20	-	4,000



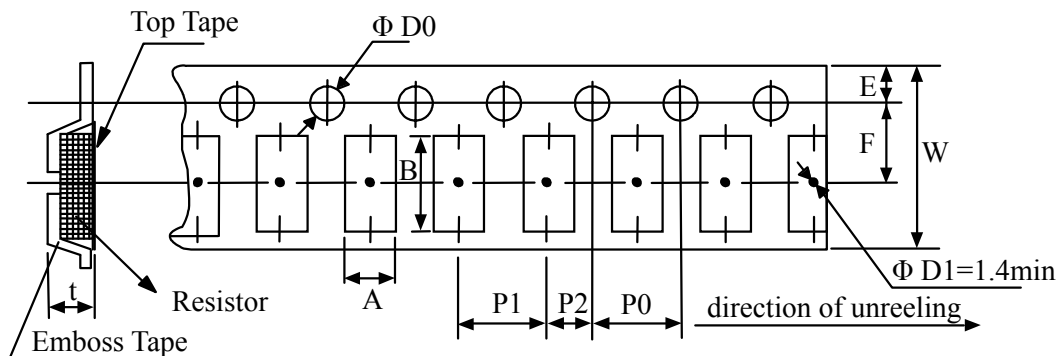
Current Sensing Resistors

► TCS Resistors - Paper Tape Specifications (Unit: mm)



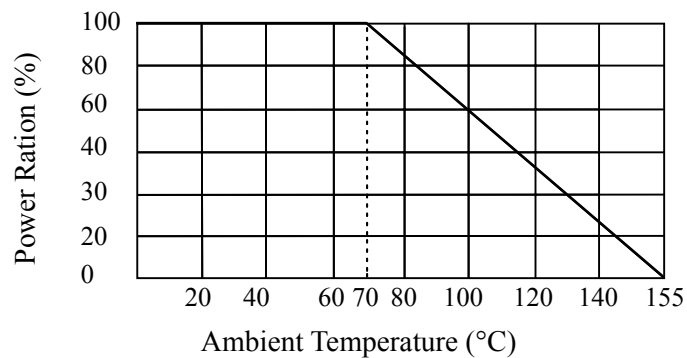
Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
TCS02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	1.55±0.05	0.40±0.03
TCS03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
TCS05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
TCS06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

► TCS Resistors - Emboss Plastic Tape Specifications (Unit: mm)



Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
TCS10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20
TCS12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.20

► Derating Curve





Current Sensing Resistors

► Environmental Characteristics - Chip Current Sensing Resistor

Item	Specification	Test Method
Temperature Coefficient of Resistance	As Spec	MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C
Short Time Overload	±0.5%	JIS-C-5202-5.5 RCWV*2.5 or Max Overloading Voltage 5seconds
Dielectric Withstand Voltage	by Type	MIL-STD-202F Method 301 Apply Max Overload Voltage for 1 minute
Insulation Resistance	>1000MΩ	MIL-STD-202F Method 302 Apply 100VDC for 1minute
Thermal Shock	±0.5%	MIL-STD-202F Method 107G -55°C~150°C, 100cycles
Load Life	±1%	MIL-STD-202F Method 108A RCWV, 70°C, 1.5 hours on , 0.5 hours off , Total 1000~1048 hours
Humidity (Steady State)	±0.5%	MIL-STD-202F Method 103B 40°C, 90~95%RH, RCWV 1.5 hours ON, 0.5 hours OFF, total 1000 ~ 1048 hours
Resistance to dry heat	±0.5%	JIS-C-5202-7.2 96hours @ +155°C without load
Low Temperature Operation	±0.5%	JIS-C-5202-7.1 1hour, -65°C followed by 45minutes of RCWV
Bending Strength	As Spec	JIS-C-5202-6.1.4 Bending Amplitude 3mm for 10seconds
Solderability	95%min coverage	MIL-STD-202F Method 208H 245°C±5°C, 2±0.5 (sec)
Resistance to Soldering Heat	±0.5%	MIL-STD-202F Method 210E 260±5°C, 10±1 second

Note: Storage Temperature: 25±3°C; Humidity: <80%RH





Current Sensing Resistors

► How to Order

TCS	12	J	T	F	S	R010	N
①	②	③	④	⑤	⑥	⑦	⑧

① Product Type

② Dimensions (L×W)

Code	Dimensions (L×W)	
02	1.00×0.50mm	0402
03	1.60×0.80mm	0603
05	2.00×1.25mm	0805
06	3.10×1.55mm	1206
10	5.00×2.50mm	2010
12	6.30×3.10mm	2512

③ Resistance Tolerance

Code	Resistance Tolerance
J	±5%
F	±1%
D	±0.5%

④ Packaging

Code	Packaging
T	Taping Reel
P	Bulk

⑤ TCR

Code	TCR
D	±50PPM/°C
E	±100PPM/°C
F	±200PPM/°C

⑥ Power Rating

Code	Power Rating
R	3W
S	2W
A	1.5W
T	1W
Q	3/4W
U	1/2W
V	1/4W
W	1/8W
X	1/10W
Y	1/16W
Z	1/32W

⑦ Resistance

Code	Resistance
R010	0.010Ω
R100	0.100Ω
1R00	1.000Ω
R100	0.100Ω

⑧ Marking

Code	Standard Marking
N	No Marking





Current Sensing Resistors

Low Resistance Low Inductance Power Resistors - BWL Series

Low Resistance Power Resistors Features

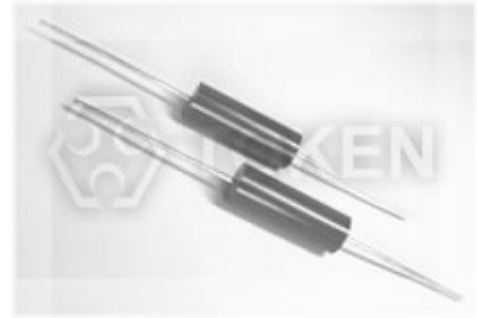
Axial Moulded Type.

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.

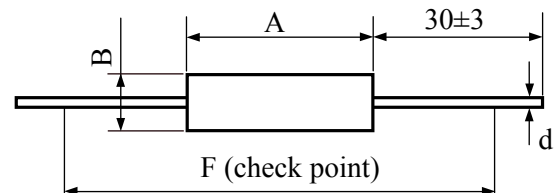
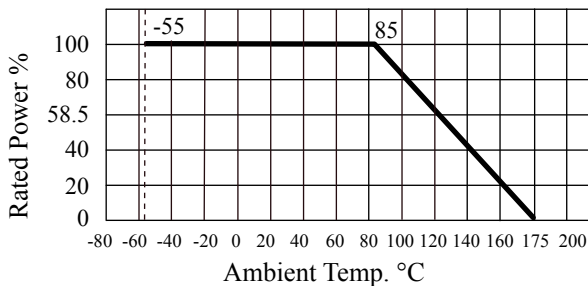
Low inductance.



Low Resistance Power Resistors Technical Specifications

Type	Rated Watts at 25°C (W)	Resistance Range (Ω)		Tolerance	Dimensions (mm)			
		Min	Max		A±0.25	ΦB±0.25	Φd	F
BWL-0.5	0.5	0.01	1	±1% ±2% ±5%	7.0	3.0	0.8	27.0
BWL-1	1.0	0.005	2		11.0	3.0	0.8	31.0
BWL-3	3.0	0.005	2		15.0	5.2	0.8	34.0
BWL-4	4.0	0.005	5		18.0	6.5	0.8	38.0
BWL-5	5.0	0.005	1		24.0	8.4	1.0	44.0
BWL-10	10.0	0.01	1		46.5	10.0	1.0	66.0

Power Derating Curve



Low Resistance Power Resistors Performance

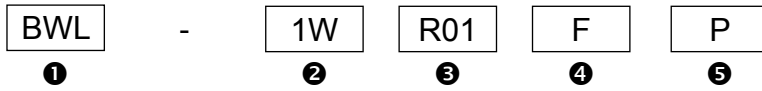
Test Items	Test Conditions	Specifications
Operating Temp. Range		-55°C ~ 175°C
Insulation Resistance	500V	>1GΩ
Dielectric Withstanding Voltage	500V AC 1 Min.	ΔR ≤ ±0.1%R
Load Life	70°C on~off cycle 1000 Hrs.	ΔR ≤ ±1%R
Moisture-Proof Load Life	40°C 95% RH on~off cycle 21 Hrs.	ΔR ≤ ±0.2%R
Resistance to soldering heat	350°C, 3.5s	ΔR ≤ ±0.1%R
Solderability	235±5°C, 5s(solder bath method)	IEC68-2-20(1968)





Current Sensing Resistors

► Low Resistance Power Resistors How to Order



❶ Product Type

❷ Resistance

Code	Resistance
R01	0.01Ω
R1	0.1Ω
1R	1Ω

❸ Resistance Tolerance

Code	Resistance Tolerance
F	±1%
G	±2%
J	±5%

❹ Packaging: P (Bulk)





Current Sensing Resistors

Low Ohmic/Value Resistors - Current Sensing - Open Air - LRA Series

Low Ohmic/Value Resistors - Open Air LR Series are super low resistance ($2\text{m}\Omega \sim$) and suitable for high power AC/DC detection of power supply circuit. All low ohmic power type are non-inductive type and custom-made products. Please contact Token sales for more information.

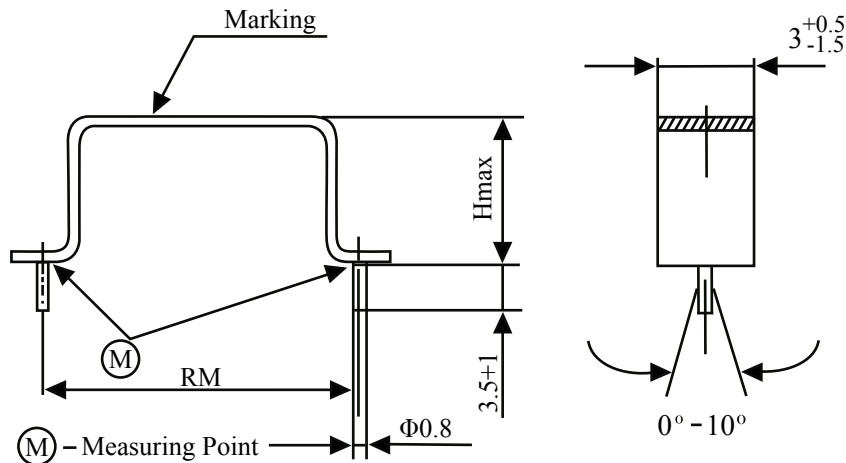
► Low Ohmic/Value Resistors - Current Sensing - Open Air Specification

Type	LRA	350-009	351-009 351-010	352-009 352-010 352-011
Power rating P70	W	0.5	1.0	1.5
Resistance range	Ω	R003~R051	R004~R068	R006~R10
E-series		E24 \geq R010		
Tolerances	%	$\pm 1, \pm 3, \pm 5, \pm 10$		
Temperature coefficient	PPM	+200~+1200		
Max. Cont. working voltage	VRMS	For all styles		
Insulation voltage (1min.)	VRMS	$\sqrt{P70 * R}$ Non insulated		
Insulation resistance	Ω	Non insulated		
Derating, linear	$^{\circ}\text{C}$	70~300(0W)		
Climatic category		55/200/56		
Temperature range	$^{\circ}\text{C}$	-50~300		
Thermal resistance	KW-1	200	100	70
Failure rate (Total, \mathbf{U}_0 max, 60% conf. lev.)	$10^{-9} * \text{h}^{-1}$	Ca.10, Depends on value		
Endurance (P70, 70,1000h)	$[\frac{\Delta R}{R}] \%$	± 3.0		
Damp heat ,steady state(40 $^{\circ}\text{C}$,93% r.h.,56d)	$[\frac{\Delta R}{R}] \%$	± 0.5		
Climatic sequence	$[\frac{\Delta R}{R}] \%$	± 0.5		
Terminal strength	$[\frac{\Delta R}{R}] \%$	± 0.5		
Terminal tensile strength	N	30		
Resistance to soldering heat (260 $^{\circ}\text{C}$,10s)	$[\frac{\Delta R}{R}] \%$	± 0.2 typ.		
Solder ability	s	2.5 Flow time, solder globule test IEC 60068-2-20-T		
Making		Value imprinted		



Current Sensing Resistors

► Low Ohmic/Value Resistors - Open Air Dimension (Unit: mm)



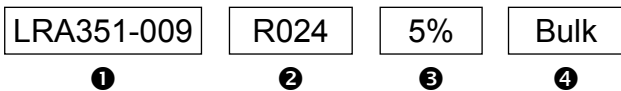
Type	H max.	RM
LRA350-009	6.5	10
LRA351-009	10.5	
LRA352-009	17.0	
LRA351-010	8.0	15
LRA352-010	14.5	
LRA352-010	16.1±1.0	14.5±1.0
LRA352-010	17.1±1.0	14.5±1.0
LRA352-011	12.0	20

Construction: The resistive elements consist of a flat metal-band. Spot welded Cu-terminals ensure high stability of contacts. Thus, this construction results in a non inductive of both high stability and overload capacity.

► Low Ohmic/Value Resistors - Open Air Packaging

Type	Packaging	Pieces	Pack.-Code
LRA350-009	Bulk	200pcs	Bulk
LRA351-009 LRA351-010	Bulk	200pcs	Bulk
LRA352-010 LRA352-011	Bulk	200pcs	Bulk

► Low Ohmic/Value Resistors - Open Air Ordering Example



- ❶ Type
- ❷ Value
- ❸ Tolerance
- ❹ Pack. -Code



Current Sensing Resistors

Open Air Resistors / Current Sense - LRB Series

Open Air Resistor Features

- Current detective for power supply circuit.
- The resistive element of a Ni-Cu alloys.
- Easy soldering.
- Low inductance.

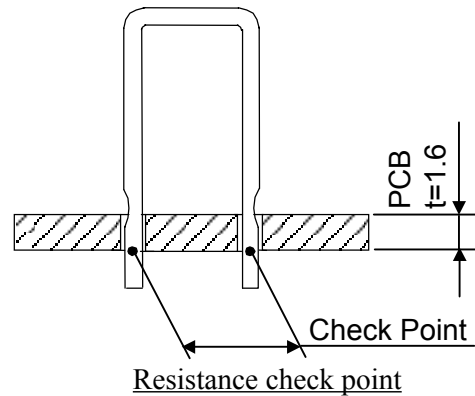
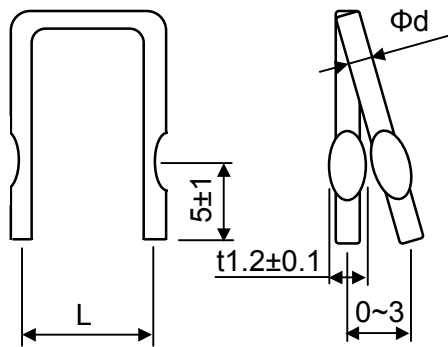


Open Air Resistor / Current Sense General Specification

Type	Max.Current Rating (A)	Resistance (mΩ)	Tolerance (%)	T.C.R ppm/°C	Rated Ambient Temp.(°C)	Operating Temp.(°C)
LRB0805	4.5	20	J: ±5%	±100	+70°C	-40 ~ +155°C
LRB0810	4.5	20	J: ±5%	±100	+70°C	-40 ~ +155°C

Open Air Resistor / Current Sense Dimension (Unit: mm)

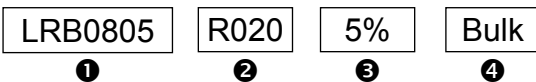
Type	L±1	t±0.1	d±0.5
LRB0805	5	1.2	0.8
LRB0810	10	1.2	0.8



Open Air Resistor / Current Sense Packaging

Type	Pieces	Pack. -Code
LRB0805	2000pcs	Bulk
LRB0810	2000pcs	Bulk

Open Air Resistor / Current Sense Ordering Example



- 1 Type
- 2 Value
- 3 Tolerance
- 4 Pack. -Code



Current Sensing Resistors

Chip Current Sensing Resistor (SMD) - LRC Series

► Features

- Low TCR $\pm 50, \pm 100 \text{PPM}/^\circ\text{C}$
- Resistance Values from 0.5m ohms to 20m ohms
- High Wattage Rating Up to 3W
- Without Laser Trimmed with Very Low Inductance
- Customized Resistance Available

► Chip Current Sensing Resistor Applications

- NB (For power management)
- MB (For power management)
- SWPS (DC-DC converter, Charger, Adaptor)
- Monitor (For power management)

► Chip Current Sensing Resistor Construction

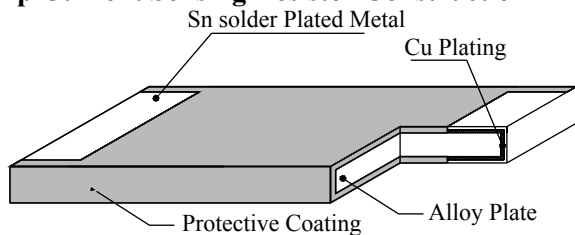


Figure 1

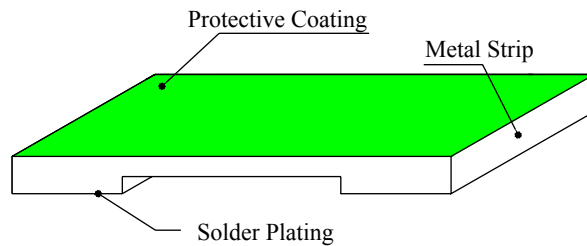
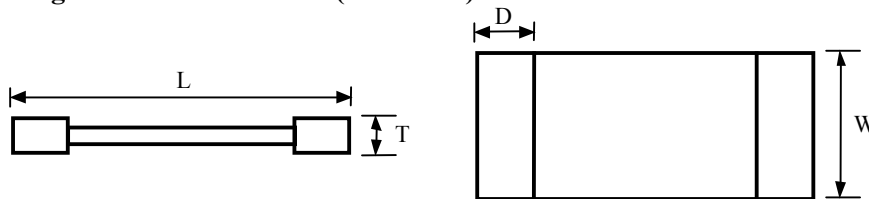


Figure 2

► Chip Current Sensing Resistor Dimensions (Unit: mm)



Type	Resistance(m Ω)	L(mm)	W(mm)	T(mm)	D(mm)
LRC12*T*****G	0.50~0.75	6.35 \pm 0.25	3.18 \pm 0.35	1.00 \pm 0.20	1.93 \pm 0.75
LRC12*T*****G	1.0~20	6.35 \pm 0.25	3.18 \pm 0.35	0.60 \pm 0.20	1.93 \pm 0.75
LRC12*T*0M50	0.50	6.35 \pm 0.25	3.18 \pm 0.25	1.40 \pm 0.20	1.30 \pm 0.30
LRC12*T*0M75	0.75	6.35 \pm 0.25	3.18 \pm 0.25	1.00 \pm 0.20	1.30 \pm 0.30
LRC12*T*R001	1.00	6.35 \pm 0.25	3.18 \pm 0.25	0.80 \pm 0.20	1.30 \pm 0.30
LRC12*T*1M50	1.50	6.35 \pm 0.25	3.18 \pm 0.25	0.65 \pm 0.20	1.30 \pm 0.30
LRC12*T*R002	2.00	6.35 \pm 0.25	3.18 \pm 0.25	0.50 \pm 0.20	1.30 \pm 0.30
LRC12*T*2M50	2.50	6.35 \pm 0.25	3.18 \pm 0.25	1.00 \pm 0.20	1.30 \pm 0.30
LRC12*T*R003	3.00	6.35 \pm 0.25	3.18 \pm 0.25	0.70 \pm 0.20	1.30 \pm 0.30
LRC12*T*3M50	3.50	6.35 \pm 0.25	3.18 \pm 0.25	0.71 \pm 0.20	1.30 \pm 0.30
LRC12*T*R004	4.00	6.35 \pm 0.25	3.18 \pm 0.25	0.60 \pm 0.20	1.30 \pm 0.30
LRC12*T*4M50	4.50	6.35 \pm 0.25	3.18 \pm 0.25	0.58 \pm 0.20	1.30 \pm 0.30
LRC12*T*R005	5.00	6.35 \pm 0.25	3.18 \pm 0.25	0.50 \pm 0.20	1.30 \pm 0.30
LRC12*T*5M50	5.50	6.35 \pm 0.25	3.18 \pm 0.25	0.47 \pm 0.20	1.30 \pm 0.30
LRC12*T*R006	6.00	6.35 \pm 0.25	3.18 \pm 0.25	0.50 \pm 0.20	1.30 \pm 0.30
LRC12*T*6M50	6.50	6.35 \pm 0.25	3.18 \pm 0.25	0.47 \pm 0.20	1.30 \pm 0.30
LRC12*T*R007	7.00	6.35 \pm 0.25	3.18 \pm 0.25	0.45 \pm 0.20	1.30 \pm 0.30
LRC12*T*R010	10.0	6.50 \pm 0.35	3.20 \pm 0.25	0.80 \pm 0.15	1.90 \pm 0.15

Notice: TOKEN is capable of manufacturing the optional spec based on customer's requirement.



Current Sensing Resistors

► Chip Current Sensing Resistor Standard Electrical Specifications

Type	Power Rating at 80°C	Operating Temp. Range	Resistance Tolerance (±%)	Resistance (mΩ)	TCR (±PPM/°C)
LRC12*TD****	1W	-55°C ~ +170°C	1, 3, 5	0.5~2.0	50
LRC12*TK****	1W			2.5~3.0	150
LRC12*TE****	1W			4.0~5.5	100
LRC12*TW****	1W			6.0~7.0	75
LRC12*TER010	1W			10	100
LRC12*TD****G	1W			7.0~20	50

Remark: Operating Current $I = \sqrt{(P/R)}$, Operating Voltage $V = \sqrt{(P * R)}$

► Chip Current Sensing Resistor High Power Rating Electrical Specifications

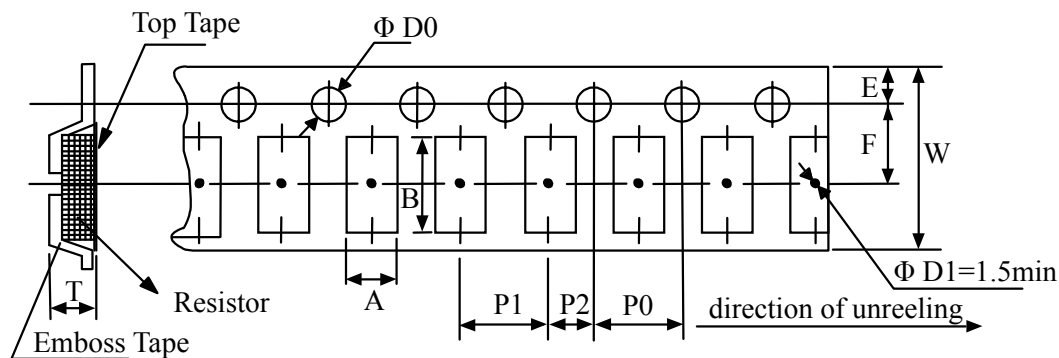
Type	Power Rating at 80°C	Operating Temp. Range	Resistance Tolerance (±%)	Resistance (mΩ)	TCR (±PPM/°C)
LRC12*TDS****	2.0W	-55°C ~ +170°C	1, 3, 5	0.5~2.0	50
LRC12*TDS****G	2.0W			7.0~10.0	50
LRC12*TDB****G	2.5W			3.5~6.0	50
LRC12*TWR****G	3.0W			2.5~3.0	75
LRC12*TDR****G	3.0W			1.0~2.0	50
LRC12*TER****G	3.0W			0.5~0.75	100

Remark: Operating Current $I = \sqrt{(P/R)}$, Operating Voltage $V = \sqrt{(P * R)}$

► Chip Current Sensing Resistor Packaging Quantity (Unit: pcs)

Type	Emboss Plastic Tape
LRC12	2,000

► Chip Current Sensing Resistor Emboss Plastic Tape Specifications (Unit: mm)



Resistance (mΩ)	A	B	W	E	F	P0	P1	P2	ΦD0	T
0.50	3.40±0.1	6.70±0.1	12.0±0.1	1.75±0.1	5.5±0.05	4.0±0.05	4.00±0.1	2.0±0.05	1.50±0.1	1.40±0.1
0.75	3.50±0.1	6.80±0.2	12.0±0.1	1.75±0.1	5.5±0.05	4.0±0.05	4.00±0.1	2.0±0.05	1.50±0.1	1.35±0.1
1~20	3.40±0.1	6.70±0.1	12.0±0.1	1.75±0.1	5.5±0.05	4.0±0.05	4.00±0.1	2.0±0.05	1.50±0.1	0.80±0.1

- Notice:**
1. The cumulative tolerance of 10 sprocket hole pitch is ±0.2mm.
 2. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
 3. A & B measured 0.3mm 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.



Current Sensing Resistors

▶ Chip Current Sensing Resistor Environmental Characteristics

Item	Specification		Test Method
	Black coating	Green coating	
Temperature Coefficient of Resistance	As Spec.		MIL-STD-202 Method 304 +25/-30/+25/+130/+25°C
Thermal Shock	±0.5%+0.5mΩ	±1%	MIL-STD-202 Method 107G -55°C~150°C, 100 cycles
Short Time Overload	±0.5%+0.5mΩ	±1%	JIS-C-5202-5.5 RCWV*2.5 or Max Overloading Voltage, 5 seconds
Resistance to Dry Heat	±1%+0.5mΩ	±1%	JIS-C-5202-7.2 96 hours @ +125°C without load
Load Life	±1%+0.5mΩ	±1%	MIL-STD-202 M108 RCWV, 70°C, 1.5 hours on, 0.5 hours off 1000~1048 hours
Resistance to Soldering Heat	±0.5%+0.5mΩ	±1%	MIL-STD-202F Method 210E 260±5°C, 10±1second
Solderability	95%min coverage		MIL-STD-202F Method 210E 260±5°C, 2±0.5second

Remark: Storage Temperature: 25±3°C; Humidity < 80%RH

▶ Chip Current Sensing Resistor How to Order

LRC	12	J	T	K	S	R003	G
①	②	③	④	⑤	⑥	⑦	⑧

① Product Type

② Dimensions (L×W)

Code	Dimensions (L×W)
12	6.3×3.1mm

③ Resistance Tolerance

Code	Resistance Tolerance
J	±5%
H	±3%
G	±2%
F	±1%

④ Packaging

Code	Packaging
T	Taping Reel

⑤ TCR

Code	TCR
D	±50PPM /°C
W	±75PPM /°C
E	±100PPM /°C
K	±150PPM /°C

⑥ Power Rating

Code	Power Rating
	Standard (1W)
S	(2W)
R	(3W)
B	(2.5W)

⑦ Resistance

Code	Resistance
0M50	0.00050Ω
0M75	0.00075Ω
1M50	0.00150Ω
R002	0.00200Ω
R010	0.01000Ω

⑧ Protective Coating

Code	Packaging
	Black Coating
G	Green Coating