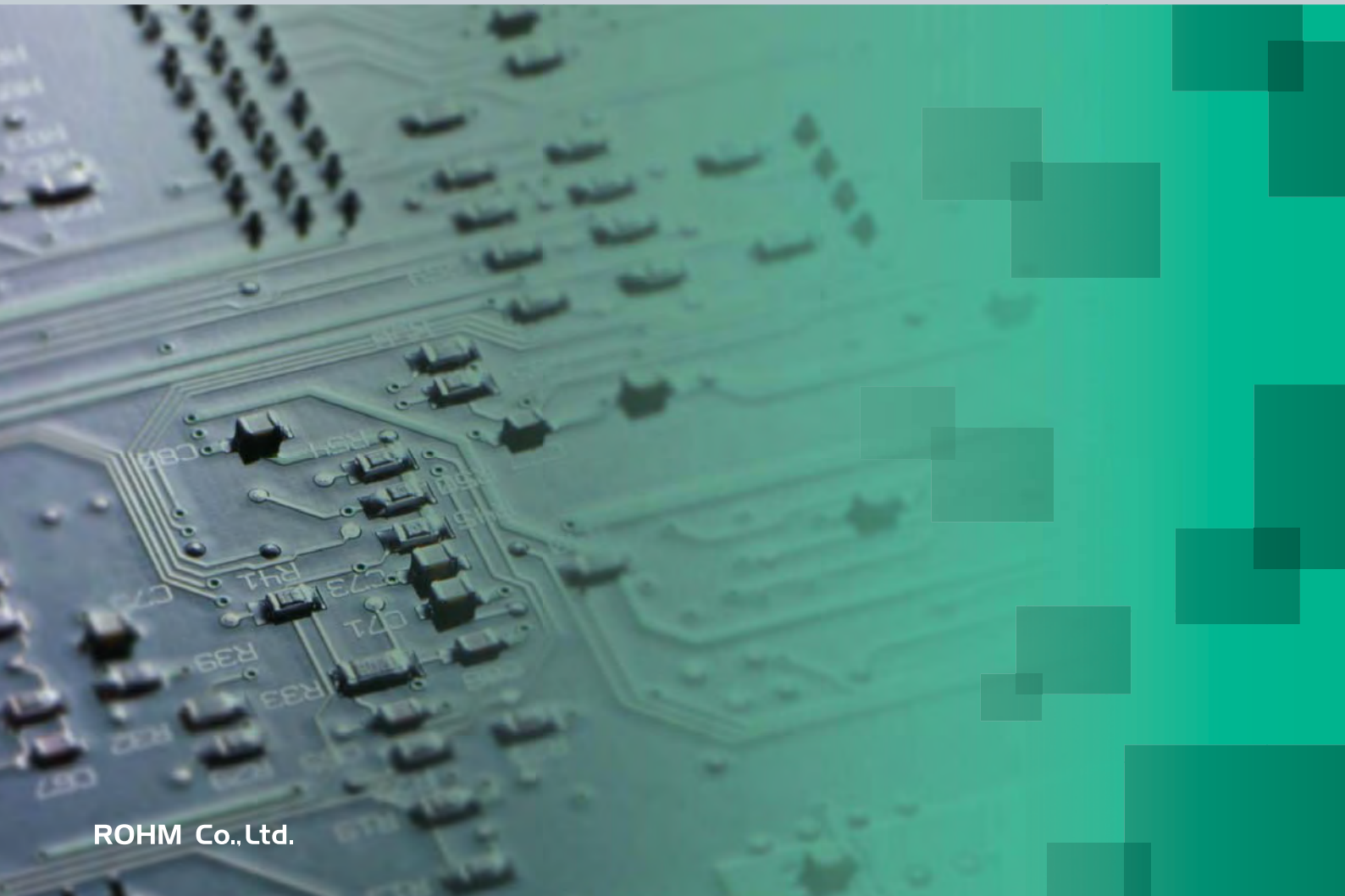
2011 2nd

Product Catalog

ROHM SEMICONDUCTOR

Passive Components

Resistors



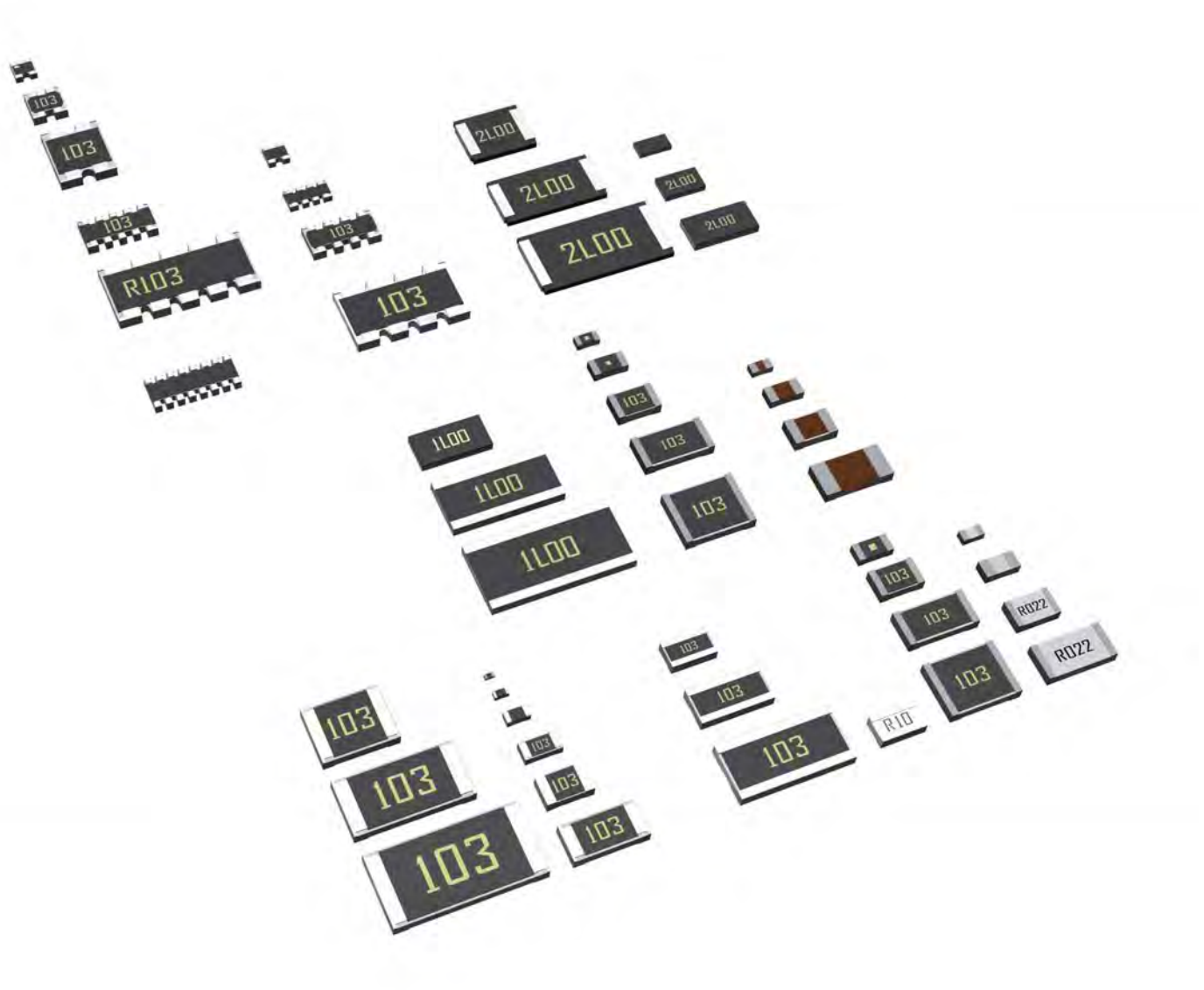
ROHM Co.,Ltd.

Resistors

ROHM, the pioneer of chip resistors, offers a wide array of chip resistors that brings added value - in terms of greater reliability, increased miniaturization, and improved performance - to sets of all types.

Select the ideal solution from our complete lineup, including the ultra-compact MCR004 series for portable applications, the high voltage KTR series, the wide terminal LTR series that offers superior reliability, the anti-sulfuration TRR series, and low-ohmic types optimized for current detection (i.e. PMR/PML/UCR/LTR series).

We are also focused on effective use of natural resources, and provide narrow pitch taping and bulk products that reduce waste and resources considerably.



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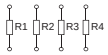
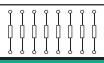
Resistor Lineup

Part No.	Size (mm [inch])	Circuit	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
Compact Thick Film Chip Resistors <MCR Series>							
MCR004	0402 [01005]		1/32W (0.031W)	J(±5%) F(±1%)	±300/±250*	10 to 3M	-55 to +125
MCR006	0603 [0201]		1/20W (0.05W)	J(±5%)	+600/-200/±250 *	1 to 10M	
				F(±1%)	±250	10 to 10M	
				D(±0.5%)	±200/±100 *	10 to 1M	
MCR01	1005 [0402]		1/16W (0.063W)	J(±5%)	+500/-250/±200 *	1 to 10M	
				F(±1%)	±100	10 to 2.2M	
				D(±0.5%)	±100/±50 *	10 to 1M	
MCR03	1608 [0603]		1/10W (0.1W)	J(±5%)	±400/±200 *	1 to 10M	-55 to +155
				FX(±1%)	±100	10 to 10M	
				D(±0.5%)	±100/±50 *	10 to 1M	
MCR10	2012 [0805]		1/8W (0.125W)	J(±5%)	±400/±200 *	1 to 10M	
				F(±1%)	±100	10 to 2.2M	
			1/10W(0.1W)	D(±0.5%)	±100/±50 *	10 to 1M	
Thick Film Chip Resistors <MCR Series>							
MCR18	3216 [1206]		1/4W (0.25W)	J(±5%)	±400/±200*	1 to 10M	
				F(±1%)	±100	10 to 2.2M	
			1/8W(0.125W)	D(±0.5%)	±100/±50*	10 to 1M	
MCR25	3225 [1210]		1/4W (0.25W)	J(±5%)	500±350/±500/±200*	1 to 3.3M	-55 to +155
				F(±1%)	±100	10 to 1M	
MCR50	5025 [2010]		1/2W (0.5W)	J(±5%)	500±350/±500/±200/±350*	1 to 560k	
				F(±1%)	±100	10 to 180k	
MCR100	6432 [2512]		1W	J(±5%)	500±350/±500/±350/±200*	1 to 100k	-55 to +125
				F(±1%)	±100	10 to 82k	
Low Ohmic Thick Film Chip Resistors <MCR Series>							
MCR01	1005 [0402]		1/16W(0.063W)	F(±1%)	±400	1 to 9.1	
MCR03	1608 [0603]		1/10W(0.1W)	F(±1%)	±400	1 to 9.1	
MCR10	2012 [0805]		1/4W (0.25W)	J(±5%)	500±300/400±200/±250*	0.047 to 0.91	
				F(±1%)		0.047 to 9.1	
MCR18	3216 [1206]		1/4W (0.25W)	J(±5%)	500±300/400±200/±250*	0.047 to 0.91	-55 to +155
				F(±1%)		0.047 to 9.1	
MCR25	3225 [1210]		1/2W (0.5W)	J(±5%)	300±300/±200*	0.047 to 0.91	
				F(±1%)		0.047 to 9.1	
MCR50	5025 [2010]		1/2W (0.5W)	J(±5%)	500±300/400±200/±250*	0.047 to 0.91	
				F(±1%)		0.047 to 9.1	
MCR100	6432 [2512]		1W	J(±5%)	500±300/400±200/±250*	0.047 to 0.91	-55 to +125
				F(±1%)		0.047 to 9.1	

Narrow Pitch Paper Tape Chip Resistors			
Part No.	Size (mm [inch])	Pitch (Taping)	Minimum Order Quantity
MCR03MZPJ **MCR03MZPFX** **MCR03MZPD**	1608 (0603)	2mm	10,000 pcs.

Part No.	Size (mm [inch])	Circuit	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
Compact Chip Resistor Networks <MNR Series>							
MNR02	1005 [0402] × 2		0.063W / Element	J(±5%)	±300	10 to 1M	-55 to +125
MNR12	1608 [0603] × 2		0.063W / Element	J(±5%)	±200		
				F(±1%)	±100		
MNR32	3216 [1206] × 2		0.125W / Element	J(±5%)	±200		
MNR04	1005 [0402] × 4		0.063W / Element	J(±5%)	±200		
MNR14	1608 [0603] × 4		0.063W / Element	J(±5%)	±200		
				F(±1%)	±100		
MNR34	3216 [1206] × 4		0.125W / Element	J(±5%)	±200		
Compact 8-Element Chip Resistor Networks <MNR Series>							
MNR15	1608 [0603] × 5		0.031W / Element	J(±5%)	±200	56 to 100k	-55 to +125
MNR35	3216 [1206] × 5		0.063W / Element	J(±5%)	±200	56 to 100k	
MNR18	1605 [0602] × 8		0.063W / Element	J(±5%)	±200	10 to 1M	

Chip Attenuators <RCN Series>								
Part No.	Size (mm [inch])	Circuit	No. of pins	No. of elements	Rated power (70°C)	Impedance (Ω)	Voltage standing wave ratio	Operating temperature range (°C)
RCN02	1010 [0404]		4	3	0.04W / Package	50	Less than 1.3	-55 to +125

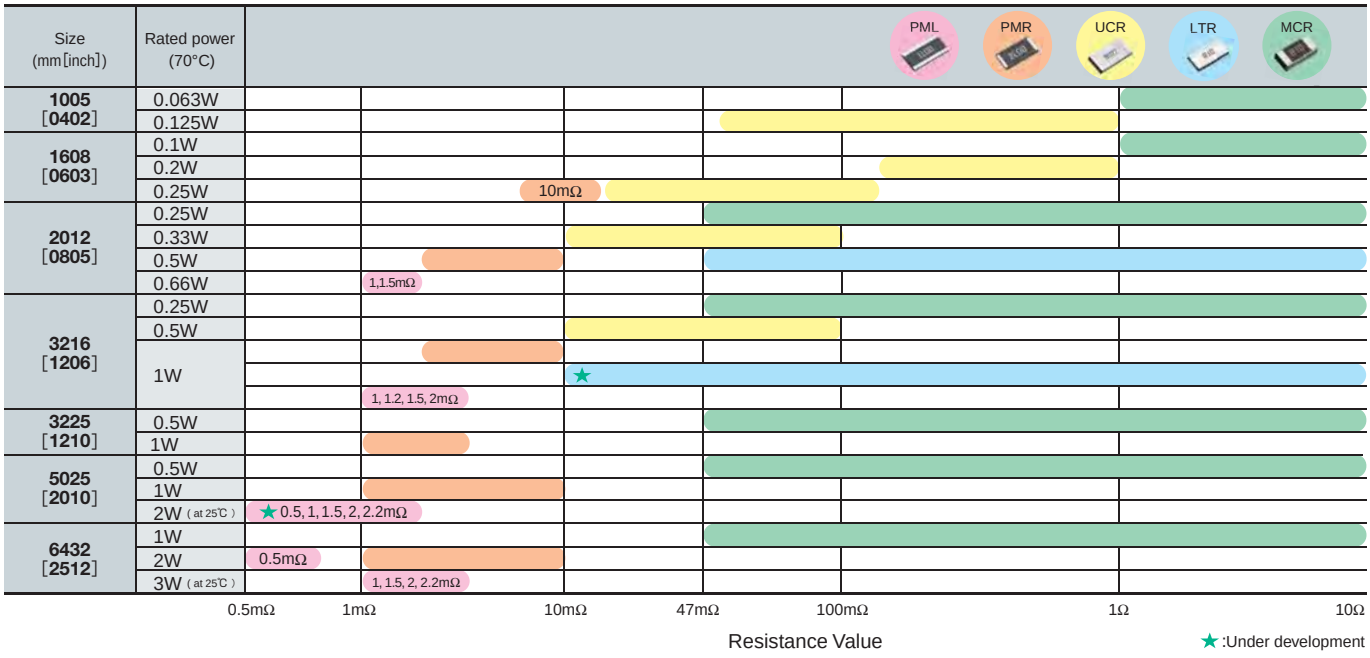
* : The temperature characteristics will vary depending on the resistance value

Part No.	Size (mm [inch])	Circuit	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (W)	Operating temperature range (°C)
Ultra-Low Ohmic Chip Resistors for Current Detection <PMR Series>							
PMR03	1608[0603]	R	1/4W (0.25W)	J(±5%) F(±1%)	0 to +150	10m	-55 to +155
PMR10	2012[0805]		1/2W (0.5W)	J(±5%) G(±2%) F(±1%)	±150	2m, 3m, 4m, 5m, 6m, 7m, 8m, 9m, 10m	
PMR18	3216[1206]		1W	J(±5%) F(±1%)	±100		
PMR25	3225[1210]		1W	J(±5%) F(±1%)	±100	1m, 2m, 3m, 4m, 5m	
PMR50	5025[2010]		1W	J(±5%) F(±1%)	±100	1m, 2m, 3m, 4m, 5m, 6m, 7m, 8m, 9m, 10m	
PMR100	6432[2512]		2W	J(±5%) F(±1%)	±100/±150*		
Ultra-Low Ohmic Wide Terminal Chip Resistors <PML Series>							
New **PML10**	2012[0805]	R	0.66W	J(±5%) G(±2%)	±200	1m, 1.5m	-55 to +155
New **PML18**	3216[1206]		1W	J(±5%) G(±2%)	±150	1m, 1.2m, 1.5m, 2m	
★ **PML50**	5025[2010]		1.5W(2W at 25℃)	J(±5%)	±200	0.5m, 1m, 1.5m, 2m, 2.2m	
PML100	6432[2512]		2W(3W at 25℃)	J(±5%)	±100	1m, 1.5m, 2m, 2.2m	
			2W		±150	0.5m	
Thick Film Low Ohmic Chip Resistors <UCR Series>							
UCR01	1005[0402]	R	1/8W (0.125W)	J(±5%) F(±1%)	0 to 300/0 to 250/0 to 200*	68m to 910m	-55 to +155
UCR03	1608[0603]		1/4W (0.25W)	J(±5%) F(±1%)	0 to 250/0 to 200/0 to 150*	20m to 200m	
			1/5W (0.2W)	J(±5%) F(±1%)	0 to 150	220m to 910m	
UCR10	2012[0805]		1/3W (0.33W)	J(±5%)	250±200/0 to 250/0 to 150*	11m to 100m	
				F(±1%)	0 to 250/0 to 150*	20m to 100m	
UCR18	3216[1206]		1/2W (0.5W)	J(±5%) F(±1%)	0 to 350/0 to 200/0 to 150*	11m to 100m	
High Power Wide Terminal Chip Resistors (Low Ohmic Type) <LTR Series>							
LTR10	2012[0805]	R	1/2W (0.5W)	J(±5%) F(±1%)	±150	47m to 9.1	-55 to +155
★ **LTR18**	3216[1206]		1W	J(±5%) F(±1%)	±300	10m to 9.1	

★ : Under development

* : The temperature characteristics will vary depending on the resistance value

Low Ohmic Series



Part No.	Size (mm [inch])	Circuit	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
Anti-Surge Chip Resistors <ESR Series>							
New **ESR01**	1005 [0402]		1/5W (0.2W)	J(±5%)	±200	10 to 1M	-55 to +155
				F(±1%)	±100		
ESR03	1608 [0603]		1/5W (0.2W)	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
				D(±0.5%)	±100	10 to 1M	
ESR10	2012 [0805]		1/4W (0.25W)	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
				D(±0.5%)	±100	10 to 1M	
ESR18	3216 [1206]		1/3W (0.33W)	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
				D(±0.5%)	±100	10 to 1M	
ESR25	3225 [1210]		1/2W (0.5W)	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
				D(±0.5%)	±100	10 to 1M	
High Voltage Resistance Chip Resistors <KTR Series>							
KTR03	1608 [0603]		1/10W (0.1W)	J(±5%)	±200	1 to 10M	-55 to +155
				F(±1%)	±100		
KTR10	2012 [0805]		1/8W (0.125W)	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
KTR18	3216 [1206]		1/4W (0.25W)	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
KTR25	3225 [1210]		1/3W (0.33W)	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
High Power Wide Terminal Chip Resistors <LTR Series>							
LTR10	2012 [0805]		1/4W (0.25W)	J(±5%)	±200	1 to 1M	-55 to +155
				F(±1%)	±100		
				D(±0.5%)	±100	10 to 1M	
LTR18	3216 [1206]		1/2W (0.5W)	J(±5%)	±200	1 to 1M	
				F(±1%)	±100		
				D(±0.5%)	±100	10 to 1M	
LTR50	5025 [2010]		1W	J(±5%)	±200	1 to 1M	
				F(±1%)	±100		
				D(±0.5%)	±100	10 to 130k	
Sulfuration-Resistant Chip Resistors <TRR Series>							
TRR01	1005 [0402]		1/16W (0.063W)	J(±5%)	+500/-250/±200 *	1 to 10M	-55 to +155
				F(±1%)	±100	10 to 2.2M	
TRR03	1608 [0603]		1/10W (0.1W)	J(±5%)	±400/±200 *	1 to 10M	
				F(±1%)	±100	10 to 10M	
TRR10	2012 [0805]		1/8W (0.125W)	J(±5%)	±400/±200 *	1 to 10M	
				F(±1%)	±100	10 to 2.2M	
TRR18	3216 [1206]		1/4W (0.25W)	J(±5%)	±400/±200 *	1 to 10M	
				F(±1%)	±100	10 to 2.2M	

* : The temperature characteristics will vary depending on the resistance value

Nominal Resistance Values

E3	10				22						47						
E6	10		15		22		33		47		68						
E12	10	12	15	18	22	27	33	39	47	56	68	82					
E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47
	51	56	62	68	75	82	91										
E96	100	102	105	107	110	113	115	118	121	124	127	130	133	137	140	143	147
	150	154	158	162	165	169	174	178	182	187	191	196	200	205	210	215	221
	226	232	237	243	249	255	261	267	274	280	287	294	301	309	316	324	332
	340	348	357	365	374	383	392	402	412	422	432	442	453	464	475	487	499
	511	523	536	549	562	576	590	604	619	634	649	665	681	698	715	732	750
	768	787	806	825	845	866	887	909	931	953	976						

Nominal Resistance

The nominal resistance of each series is listed above. These values are based on approximations of the geometric ratios at right.

Indicated Resistances

Regarding the nominal resistances, products with a resistance tolerance of ±5% are indicated by 3 digits, while ±1% products are denoted by 4 digits. The first 2 or 3 digits (depending on tolerance type) are significant figures, while the last digit signifies the number of zeroes. In addition, an 'R' is used to indicate a decimal point.

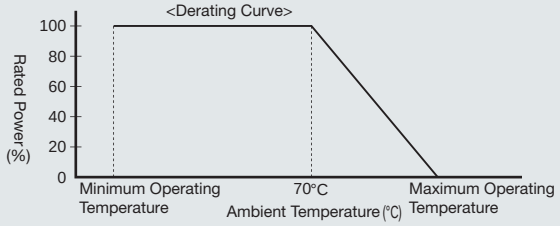
Ex. 1 22Ω→22×10^{0}Ω→220 (Indicates a multiplier of '0' → 100)
Ex. 2 47kΩ→47×10^{3}Ω→473 (Indicates a multiplier of '3' → 103)
Ex. 3 1.2MΩ→12×10^{5}Ω→125 (Indicates a multiplier of '5' → 105)
Ex. 4 2.7Ω→2R7 ('R' indicates a decimal, for resistances less than 10Ω)
Ex. 5 1130Ω→113×10^{1}Ω→1131 (Indicates a multiplier of '1' → 101 - the 4 digits denote F Class products with a tolerance of ±1%)
Ex. 6 0.10Ω→R10

Series	Ratio	Remarks
E6	$\sqrt[6]{10} \fallingdotseq 1.46$	
E12	$\sqrt[12]{10} \fallingdotseq 1.21$	Rounded to 2 significant figures
E24	$\sqrt[24]{10} \fallingdotseq 1.10$	
E96	$\sqrt[96]{10} \fallingdotseq 1.02$	Rounded to 3 significant figures

■ For the basic guidelines of the resistor, please refer to the technology report issued by JEITA (Japan Electronics and Information Technology Industries Association): JEITA RCT-2121A 'Guidelines of Notabilia for Fixed Resistors for Use In Electronic Equipment (Safety Application Guide for Fixed Resistors for Use In Electronic Equipment)'.

Notes on Rated Power

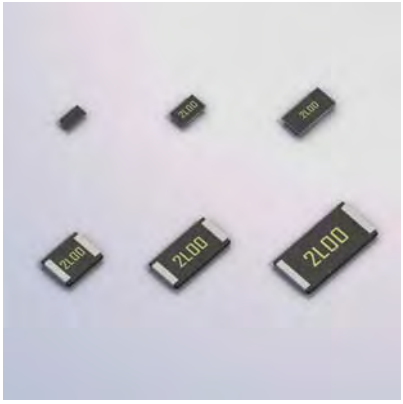
・Please reduce the load power based on the derating curve at right for temperatures exceeding the ambient temperature.



Usage Precautions

* 1 : Please verify and confirm operation in the event of transient load pulses (large loads in a short time) while mounted in the customer's set. In addition, the performance and reliability of the product may suffer if the load voltage exceeds the rated value during steady state operation. Therefore, please ensure that the rated voltage is not exceeded.
* 2 : The Rated Voltage (V) is calculated by $\sqrt{\text{Rated Power (W)} \times \text{Nominal Resistance } (\Omega)}$ or the Limiting Element Voltage, whichever is smaller.

Ultra-Low Ohmic Chip Resistors for Current Detection



PMR Series (1mΩ～)

Summary

These products feature a resistive element comprised of a metallic substrate with superior electrical characteristics. An original structure is utilized for low resistance values (1mΩ to 10mΩ) with improved current detection accuracy.

Features

- Compact
- High power
- High performance

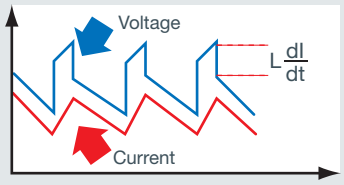
Applications

- Current detection sets
- Notebook PCs, HDDs, mobile phones, DC/DC converters, automotive systems, and more

Trimless design ensures greater current detection accuracy

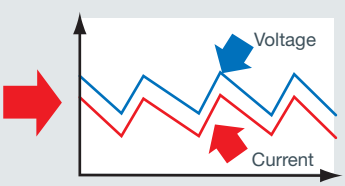
- Ideal for high-speed switching circuits
- Excellent heat dissipation characteristics
- Stable operation, even under extreme temperature fluctuations

[Conventional Structure (With Laser Trim)]



A large inductance makes it difficult to accurately detect current

[PMR Series with Trimless Structure]

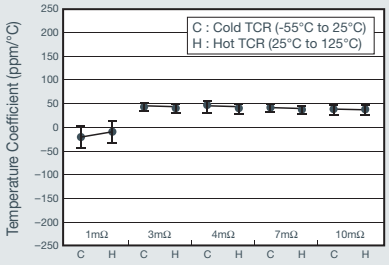


Reduced inductance component results in high accuracy with fewer detection errors

Superior resistance-temperature characteristics

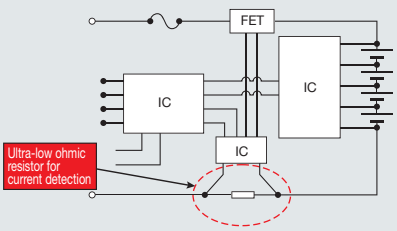
- Stable resistance temperature characteristics

Temperature Characteristics

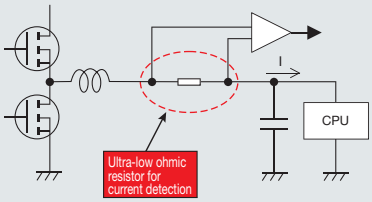


Circuit Examples

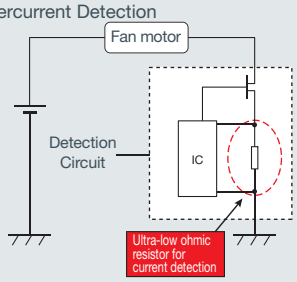
Battery Level Detection



CPU Drive Current Control



Overcurrent Detection



Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (mΩ)	Operating temperature range (°C)
PMR03	1608 [0603]	1/4W (0.25W)	J(±5%) F(±1%)	0 to +150	10	-55 to +155
PMR10	2012 [0805]	1/2W (0.5W)	J(±5%) G(±2%) F(±1%)	±150	2, 3, 4, 5, 6, 7, 8, 9, 10	
PMR18	3216 [1206]	1W	J(±5%) F(±1%)	±100		
PMR25	3225 [1210]	1W	J(±5%) F(±1%)	±100	1, 2, 3, 4, 5	
PMR50	5025 [2010]	1W	J(±5%) F(±1%)	±100	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	
PMR100	6432 [2512]	2W	J(±5%) F(±1%)	±100 *		

*1mΩ and 2mΩ only: ±150ppm/°C

Ultra-Low Ohmic Wide Terminal Chip Resistors for Current Detection

PML Series (0.5mΩ～)

Summary

These low-ohmic (0.5mΩ to 2.2mΩ) , wide terminal types optimized for current detection utilize a metallic substrate for the resistive element that provides excellent electrical characteristics, along with a novel design that improves current detection precision.

Features

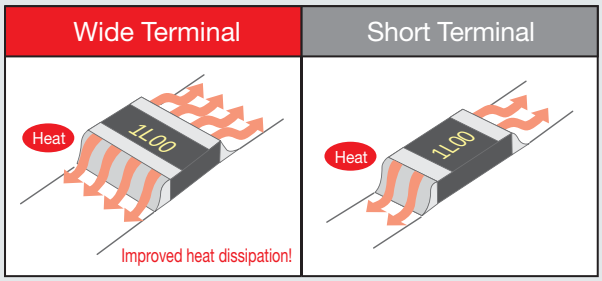
- High power
- High performance
- High reliability

Applications

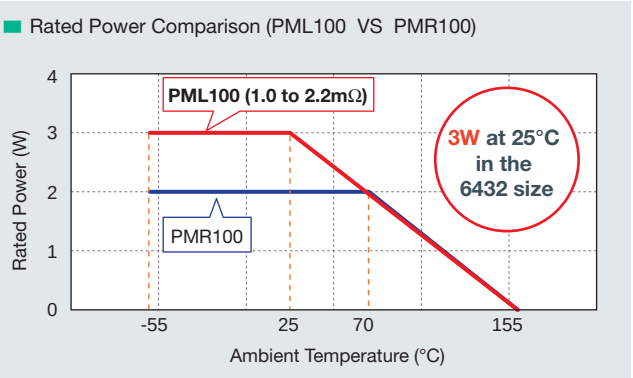
- Automotive (i.e. power steering, ECU)
- Current detection in large current motors

Wide terminal configuration improves reliability

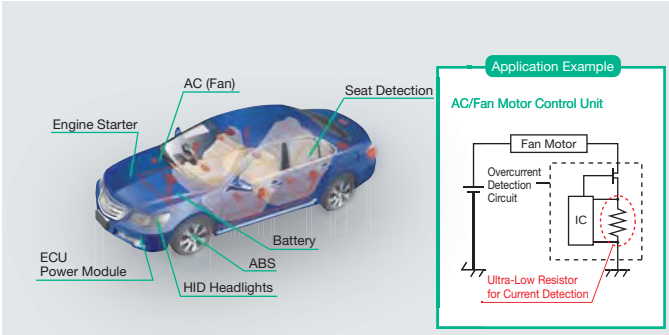
Wider contact area with the mounting plate provides a more reliable connection.
Ideal for vehicle applications exposed to temperature cycling / fluctuations.



High rated power



Application Examples



Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (mΩ)	Operating temperature range (°C)
New PML10	2012[0805]	0.66W	J(±5%) G(±2%)	±200	1.0, 1.5	-55～+155
New PML18	3216[1206]	1W	J(±5%) G(±2%)	±150	1.0, 1.2, 1.5, 2.0	
★ PML50	5025[2010]	1.5W (2W at 25℃)	J(±5%)	±200	0.5, 1.0, 1.5, 2.0, 2.2	
PML100	6432[2512]	2W (3W at 25℃)	J(±5%)	±100	1.0, 1.5, 2.0, 2.2	
		2W		±150	0.5	

★ : Under development

*The designs and specifications are subject to change without notice

Thick Film Low Ohmic Chip Resistors

UCR Series (11mΩ～)

Summary

The rear-mount design ensures high detection accuracy in a range of resistances (11mΩ to 910mΩ).

Features

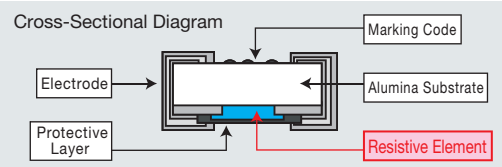
- Compact
- High performance

Applications

- Notebook PCs, mobile phones, HDDs, portable audio players, power supplies, motors, and more

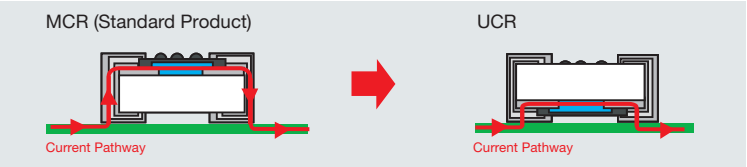
Rear-mount configuration

The UCR series is configured with the resistive element at the base (rear).



Resistance variations minimized during mounting

The rear-mount configuration shortens the current pathway by eliminating excess components.



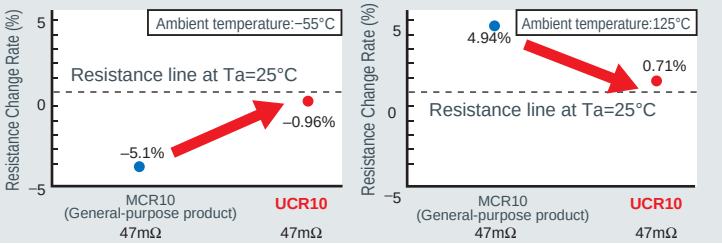
Higher rated power

The original structure increases the rated power.

Size (mm[inch])	UCR Series	ROHM's Standard Resistors
1005[0402]	0.125W	0.063W
1608[0603]	0.25W/0.2W	0.1W
2012[0805]	0.33W	0.25W
3216[1206]	0.5W	0.25W
3225[1210]	-	0.5W

Stable, low resistance characteristics guaranteed - regardless of ambient conditions

Comparison of the resistance change rate between the UCR series and general-purpose products



Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
UCR01	1005 [0402]	1/8W (0.125W)	J(±5%) F(±1%)	0 to 300	68m to 91m	-55 to +155
				0 to 250	100m to 200m	
				0 to 200	220m to 910m	
UCR03	1608 [0603]	1/4W (0.25W)	J(±5%) F(±1%)	0 to 250	20m to 047m	
				0 to 200	51m to 91m	
				0 to 150	100m to 200m	
		1/5W (0.2W)	J(±5%) F(±1%)	0 to 150	220m to 910m	
UCR10	2012 [0805]	1/3W (0.33W)	J(±5%)	250±200	11m to 18m	
				0 to 250	20m to 47m	
				0 to 150	51m to 100m	
			F(±1%)	0 to 250	20m to 47m	
				0 to 150	51m to 100m	
UCR18	3216 [1206]	1/2W (0.5W)	J(±5%) F(±1%)	0 to 350	11m to 18m	
				0 to 200	20m to 39m	
				0 to 150	43m to 100m	

* The designs and specifications are subject to change without notice

High Power Wide Terminal Chip Resistors (Low Ohmic Type)

LTR Series (10mΩ～)

Summary

These wide terminal chip resistors improve thermal dissipation for higher rated power.

Features

- High power
- High performance
- High reliability

Applications

- Automotive systems
- PCs, HDDs, mobile phones, power supplies, motors and other applications requiring current detection

Wide terminal design strong against temperature cycling

Longer terminal width increases junction reliability

Rear-mount design improves current detection accuracy

Rear-mount construction minimizes resistance changes during mounting.

(Front)

(Side)

Resistive element configured at the rear

Higher rated power

Size (mm [inch])	General-purpose MCR Series	LTR Series
2012 [0805]	0.25W	0.5W
3216 [1206]	0.25W	1W

Superior resistance-temperature coefficient

Size (mm [inch])	General-purpose MCR Series	LTR Series
2012 [0805]	500±300 (0.047 to 0.091Ω) 400±200 (0.1 to 0.13Ω) ±250 (0.15 to 9.1Ω)	Improved TCR ±150

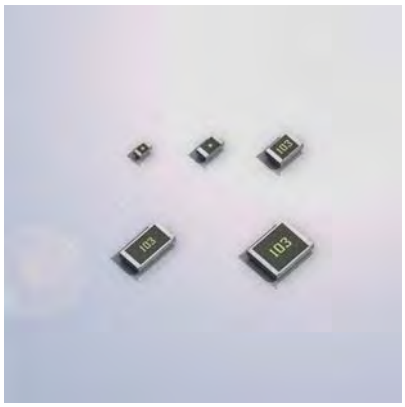
Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
LTR10	2012[0805]	1/2W (0.5W)	J(±5%) F(±1%)	±150	47m to 9.1	-55 to +155
★ LTR18	3216[1206]	1W	J(±5%) F(±1%)	±300	10m to 9.1	

★ : Under development

* The designs and specifications are subject to change without notice

Anti-Surge Chip Resistors



ESR Series

Summary

Significantly improved anti-surge characteristics have been achieved through utilization of original resistor construction and trimming processes.

Features

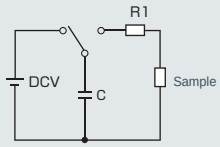
- Small
- Surge-resistant
- High power

Applications

- Electronic devices requiring anti-surge and anti-pulse characteristics

2kV to 5kV* electrostatic discharge resistance (*EIAJ4701-1 Human Body Model)

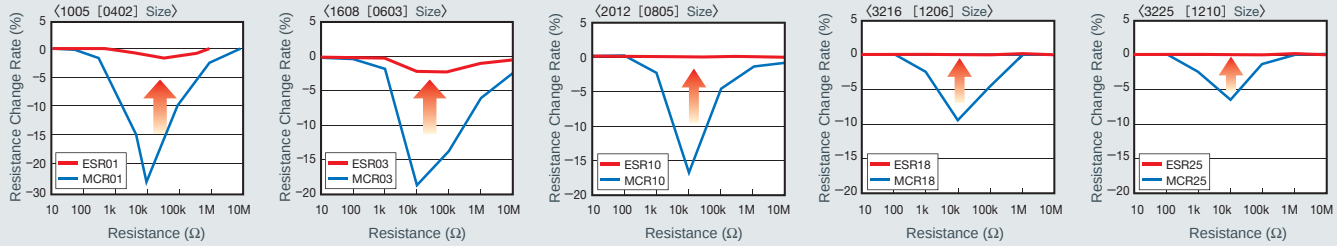
An electrostatic discharge resistance of 3kV has been achieved using novel construction and trimming processes, resulting in a greater degree of reliability.



	ESR01	ESR03/10/18	ESR25
DCV (Applied Voltage)	2kV	3kV	5kV
No. of Cycles	±5 times	±10 times	±10 times
C (Capacitance)	100pF	100pF	100pF
R1 (Discharge Resistance)	1.5kΩ	1.5kΩ	1.5kΩ

Significant improvement in endurance surge characteristics

■ Anti-surge Chip Resistors (ESR Series) vs. Conventional Chip Resistors (MCR Series)



Double the conventional rated power

A higher rated power enables smaller resistors to be used, saving space.

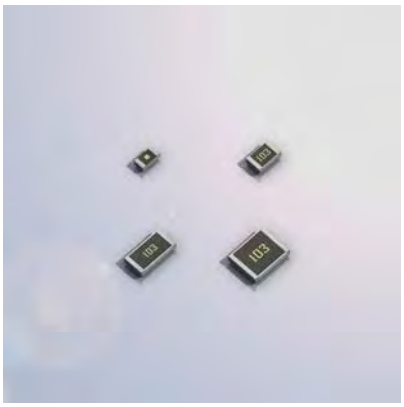
Size(mm [inch])	ESR Series	General-purpose MCR Series
New 1005[0402]	0.2W	0.063W
1608[0603]	0.2W	0.1W
2012[0805]	0.25W	0.125W
3216[1206]	0.33W	0.25W
3225[1210]	0.5W	0.25W
5025[2010]	–	0.5W

Downsizing

Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
New ESR01	1005 [0402]	1/5W (0.2W)	J(±5%)	±200	10 to 1M	-55 to +155
			F(±1%)	±100		
ESR03	1608 [0603]	1/5W (0.2W)	J(±5%)	±200	1 to 10M	
			F(±1%)	±100		
			D(±0.5%)	±100	10 to 1M	
ESR10	2012 [0805]	1/4W (0.25W)	J(±5%)	±200	1 to 10M	
			F(±1%)	±100		
			D(±0.5%)	±100	10 to 1M	
ESR18	3216 [1206]	1/3W (0.33W)	J(±5%)	±200	1 to 10M	
			F(±1%)	±100		
			D(±0.5%)	±100	10 to 1M	
ESR25	3225 [1210]	1/2W (0.5W)	J(±5%)	±200	1 to 10M	
			F(±1%)	±100		
			D(±0.5%)	±100	10 to 1M	

High Voltage Resistance Chip Resistors



KTR Series

Summary

High voltage characteristics (more than double that of conventional products) are made possible through the use of proprietary construction and trimming processes.

Features

- Compact
- High voltage

Applications

- Camera flash circuits
- Inverter circuits
- Power supplies

High voltage resistance

ROHM's unique resistance pattern and trimming design prevent concentration of the voltage load, resulting in more than twice the voltage resistance of our own general-purpose products (MCR series).

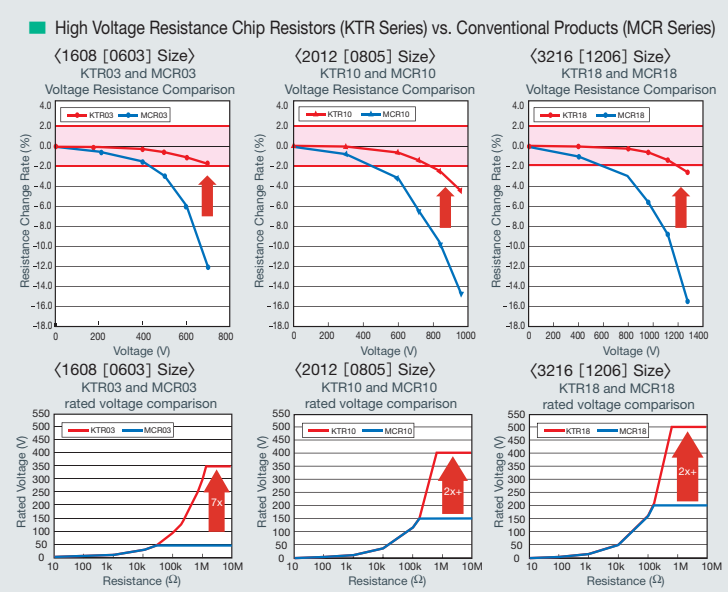
High voltage resistance circuits requiring multiple resistors can reduce the number of components by replacing conventional chip resistors with KTR series units. They are ideal for mobile products, which are becoming increasingly compact and thin.

[Limiting Element Voltage]

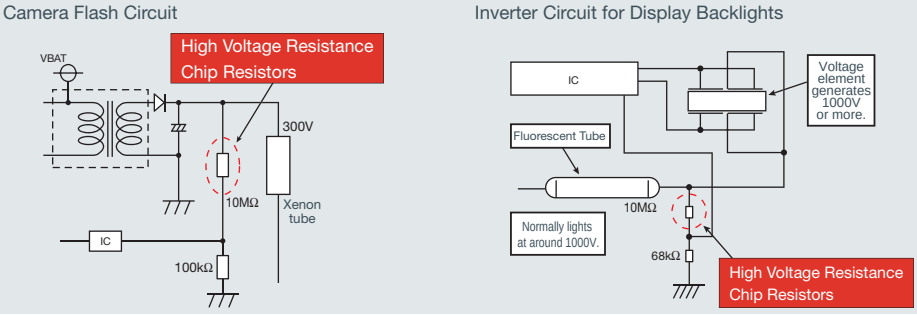
The rated voltage is defined as the maximum voltage that can be applied continuously and is calculated using the following equation:

$$\text{Rated Voltage (V)} = \sqrt{\text{Rated Power (W)} \times \text{Nominal Resistance (Ω)}}$$

Note that the limiting element voltage of the element should not to be exceeded.



Circuit Examples



Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Limiting Element Voltage(V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
KTR03	1608 [0603]	1/10W (0.1W)	350	J(±5%)	±200	1 to 10M	-55 to +155
				F(±1%)	±100		
KTR10	2012 [0805]	1/8W (0.125W)	400	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
KTR18	3216 [1206]	1/4W (0.25W)	500	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		
KTR25	3225 [1210]	1/3W (0.33W)	600	J(±5%)	±200	1 to 10M	
				F(±1%)	±100		

High Power Wide Terminal Chip Resistors

LTR Series

Summary

Placing the electrodes on the long sides of the resistor reduces the distance between the electrodes, improving temperature cycling strength.

Features

- High power
- Strong against surges
- Improved junction reliability

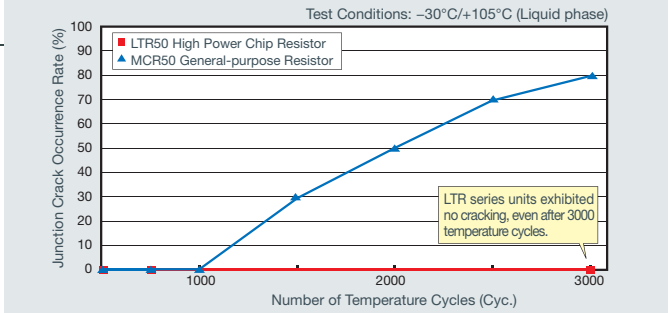
Applications

- Automotive systems
- Home appliances
- Power supplies and the like

Superior connection reliability against thermal cycling

- Outstanding junction reliability characteristics against heat cycling.
  The LTR series is highly resistant to soldering cracks caused by thermal stress.

	Wide Terminal LTR Series	General-purpose MCR Series
Distance Between Electrodes	Short	Long
Effects of PCB Expansion/Contraction	Mechanical stress on junction area **small**	Mechanical stress on junction area **large**
Junction Reliability	Very good	Good



Significantly higher rated power

Higher rated power makes it possible to use smaller resistors.

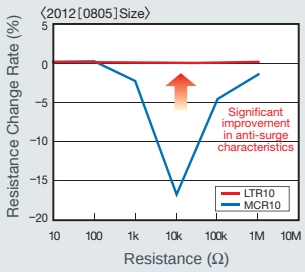
Size(mm [inch])	LTR Series	MCR Series
2012[0805]	0.25	0.125
3216[1206]	0.5	0.25
5025[2010]	1	0.5
6432[2512]	–	1

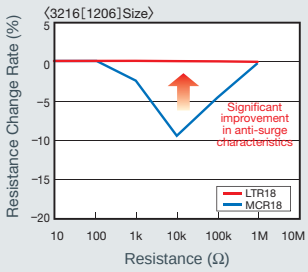
3kV* electrostatic discharge resistance

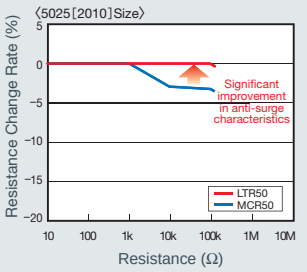
(*EIAJ4710-1 Human Body Model)

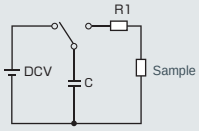
ROHM's unique resistive element structure and trimming design ensure greatly improved surge resistance characteristics.

■ High Power Chip Resistors (Wide Terminal Type) vs. General-purpose Chip Resistors (MCR Series)







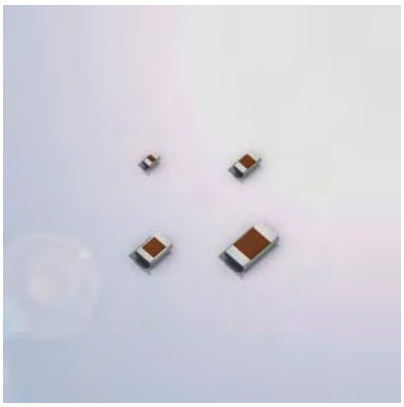


	LTR10/LTR18	LTR50
DCV (Applied Voltage)	3kV	5kV
No. of Cycles	±10times	±10times
C (Capacitance)	100pF	100pF
R1 (Discharge Resistance)	1.5kΩ	1.5kΩ

Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
LTR10	2012 [0805]	1/4W (0.25W)	J(±5%)	±200	1 to 1M	-55 to +155
			F(±1%)	±100		
			D(±0.5%)	±100	10 to 1M	
LTR18	3216 [1206]	1/2W (0.5W)	J(±5%)	±200	1 to 1M	
			F(±1%)	±100		
			D(±0.5%)	±100	10 to 1M	
LTR50	5025 [2010]	1W	J(±5%)	±200	1 to 1M	
			F(±1%)	±100		
			D(±0.5%)	±100	10 to 130k	

Sulfuration-Resistant Chip Resistors



TRR Series

Summary

The special internal structure prevents sulfurated gases from entering, resulting in greater reliability and stabler operation in sulfur-rich environments compared to general-purpose products.

Features

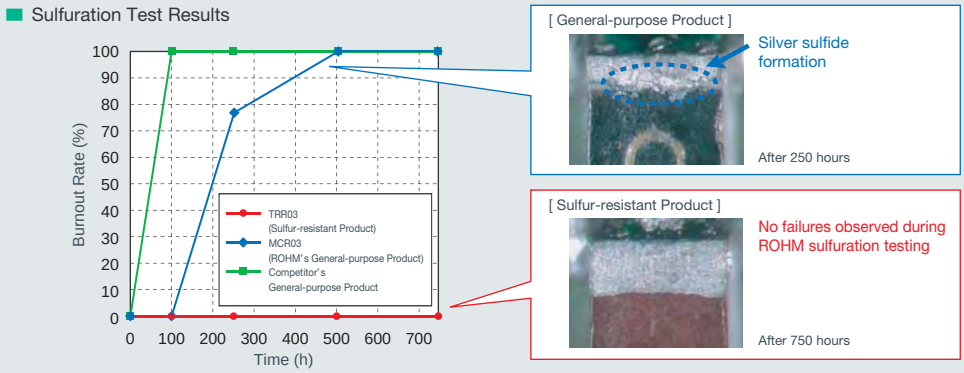
- High sulfuration resistance

Applications

- Circuits exposed to sulfur-rich environments, such as those in automotive systems.

Excellent anti-sulfuration characteristics

Until now, resistors were particularly susceptible to failure in sulfur-rich environments. In response to this, ROHM's offers the TRR series featuring an internal structure resistant to silver migration and the formation of silver sulfide, resulting in a greater level of reliability.



ROHM Sulfuration Test Conditions: Sulfur powder sealed in a desiccator at high temperature (110°C)

Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
TRR01	1005 [0402]	1/16W (0.063W)	J(±5%)	+500/-250	1 to 9.1	-55 to +155
				±200	10 to 10M	
			F(±1%)	±100	10 to 2.2M	
TRR03	1608 [0603]	1/10W (0.1W)	J(±5%)	±400	1 to 9.1	
				±200	10 to 10M	
			F(±1%)	±100	10 to 10M	
TRR10	2012 [0805]	1/8W (0.125W)	J(±5%)	±400	1 to 9.1	
				±200	10 to 10M	
			F(±1%)	±100	10 to 2.2M	
TRR18	3216 [1206]	1/4W (0.25W)	J(±5%)	±400	1 to 9.1	
				±200	10 to 10M	
			F(±1%)	±100	10 to 2.2M	

Also compatible with jumpers.

0402-Sized Ultra-Compact Chip Resistors

MCR004 Series

Summary

ROHM's 0402-sized ultra-compact chip resistors are the smallest in the world, contributing to increased space savings in mobile devices and module products.

Features

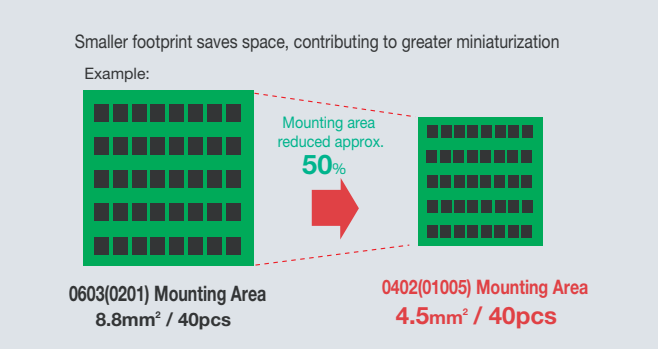
- Compact
- Space-saving

Applications

- Modules
- Portable audio
- Mobile phones
- Digital cameras

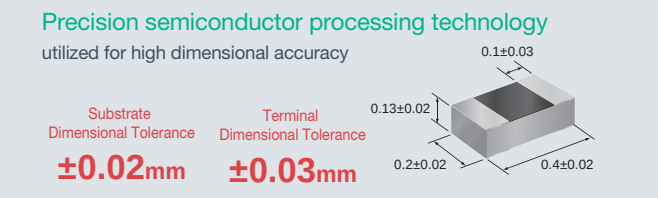
Lightweight · Space-saving

The MCR004 (0402) series reduces mounting area and weight by 56% and 72%,respectively, contributing to even greater miniaturization.



High dimensional precision

Ultra-compact chip resistors in the 0402 and 0603 size require more precise process technologies (compared to conventional processes) in order to ensure high dimensional accuracy.

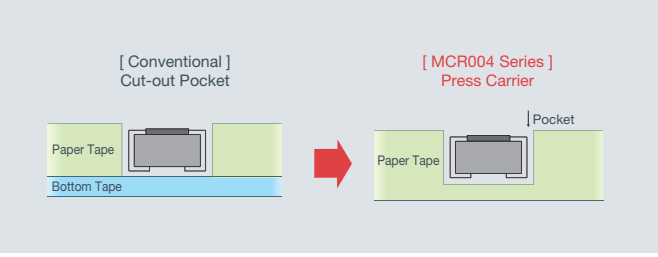


Press carrier tape applications

Press carrier tape tape is used in order to reduce failures during the mounting process.

— Press Carrier Tape Features —

- No adhesive substance on the bottom of the pocket (bottom tape not used).
- Highly precise pocket position.



Lineup

Part No.	Size (mm [inch])	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range (Ω)	Operating temperature range (°C)
MCR004	0402 [01005]	1/32W (0.031W)	J(±5%)	±300	10 to 91	-55 to +125
			F(±1%)	±250	100 to 3M	

Also compatible with jumpers.

<Taping Specifications>

Part No.	Taping No.	Taping specs	Min. order quantity (pcs)
MCR004	YZP	Paper tape (2mm pitch)	15,000
	RZP	Embossed tape (1mm pitch)	40,000

Narrow Pitch Paper Tape Products

MCR03MZP Series

Summary

Half the pitch of standard products results in double the quantity per reel in the same reel size (ϕ180mm).

Features

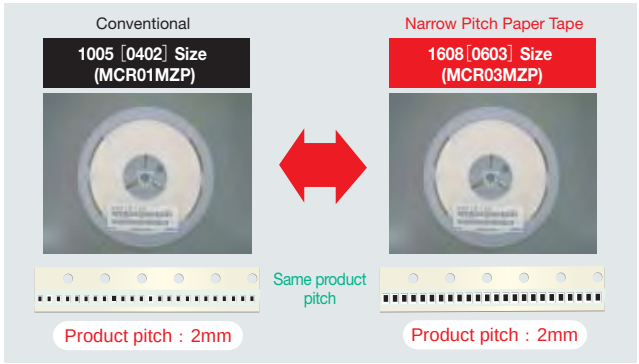
- Halves the number of reel changes
- Cuts the amount of packaging waste by 50%

Applications

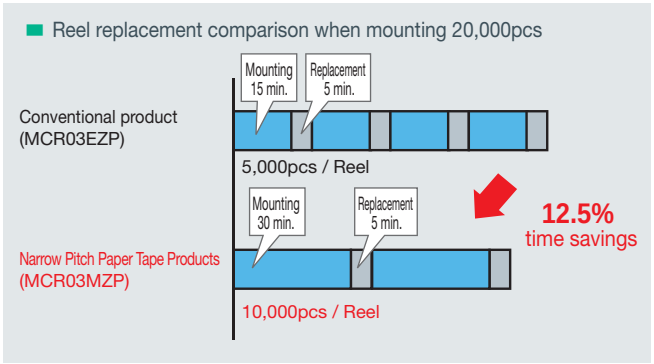
- All products

Doubles the time between reel replacement. Cuts package waste in half.

No new equipment required · Easy to install



Improves productivity by halving the number of reel replacements

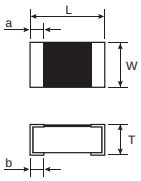
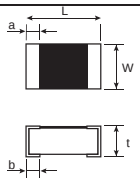
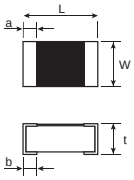
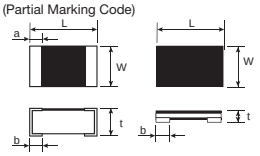
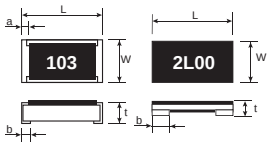
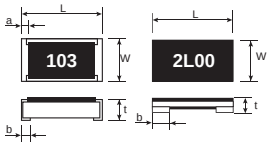
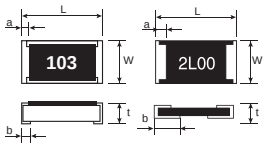
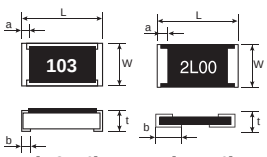
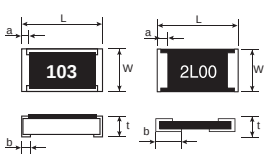


Lineup

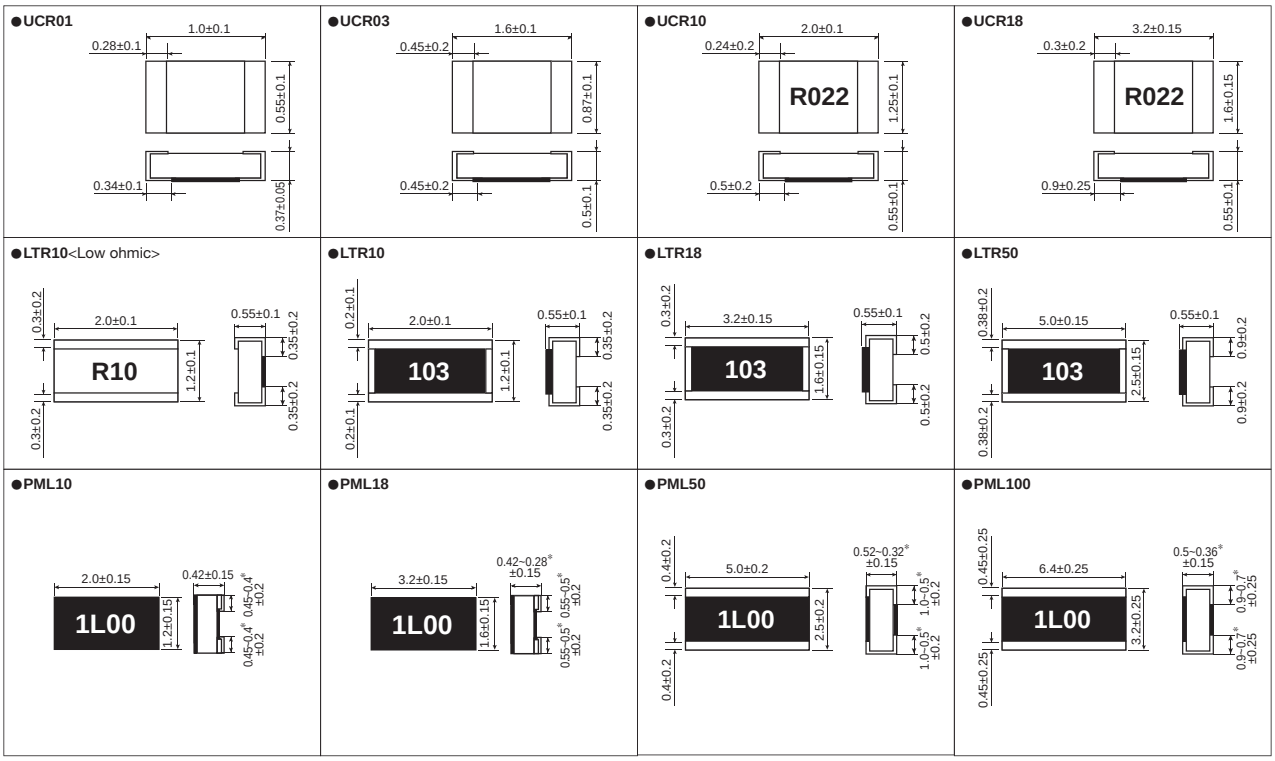
Part No.	Size (mm [inch])	Product Pitch (Taping)	Reel
MCR03MZPJ	1608 [0603]	2mm	10,000 pcs.
MCR03MZPFX			
MCR03MZPD			

Dimensions

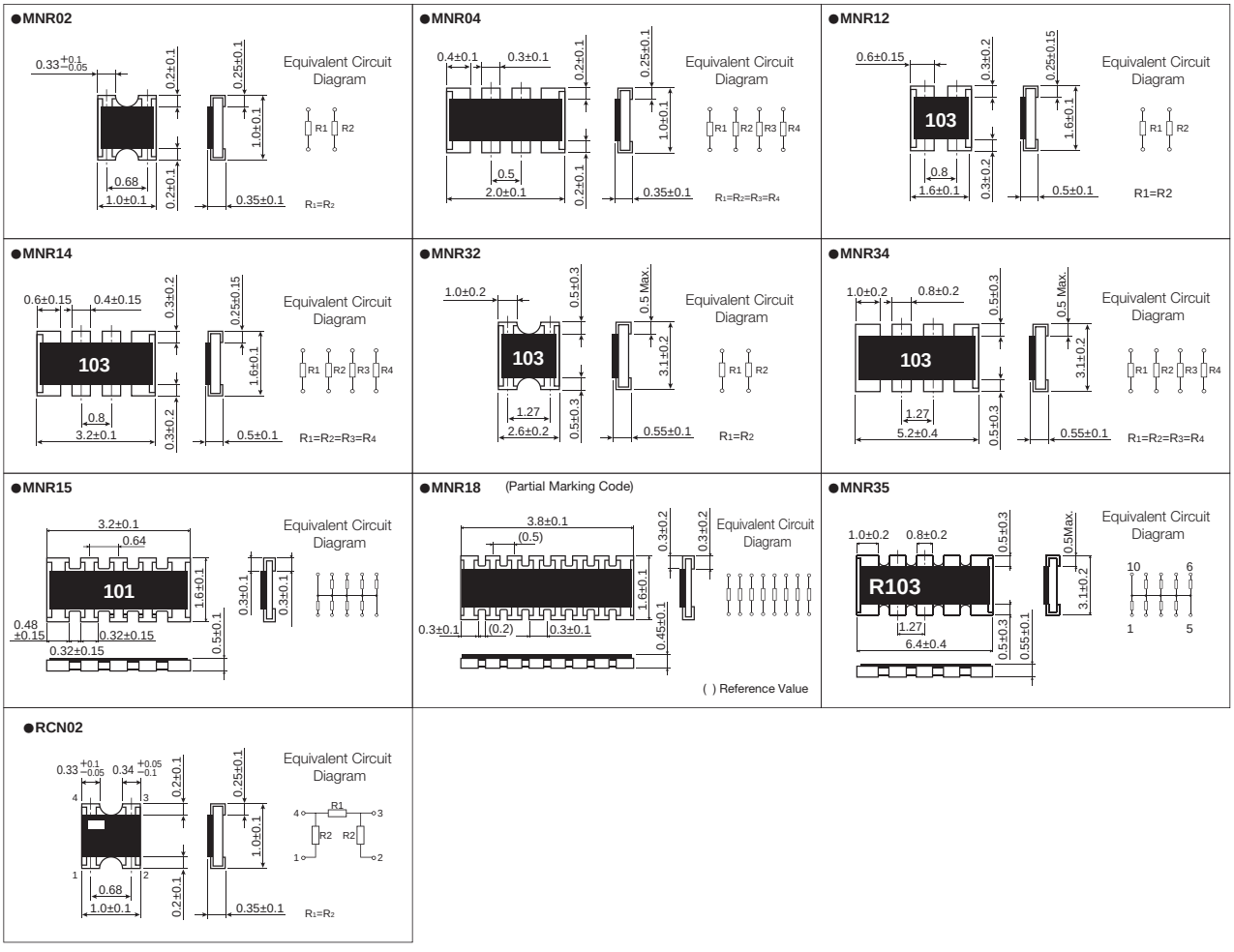
Unit : mm

Dimensions	Series	L	W	t	a	b
0402 (01005) 	**MCR004**	0.4±0.02	0.2±0.02	0.13±0.02	0.1±0.03	0.1±0.03
0603 (0201) 	**MCR006**	0.6±0.03	0.3±0.03	0.23±0.03	0.1±0.05	0.15±0.05
1005 (0402) 	**MCR01** **ESR01**	1.0±0.05	0.5±0.05	0.35±0.05	0.2±0.1	$0.25^{+0.05}_{-0.1}$
	TRR01				0.33±0.08	
1608 (0603) (Partial Marking Code)  [MCR/KTR/ESR/TRR] [PMR03]	**MCR03** **KTR03** **ESR03**	1.6±0.1	0.8±0.1	0.45±0.1	0.3±0.2	0.3±0.2
	TRR03				0.4±0.1	
	PMR03	1.6±0.15	0.8±0.15	0.25±0.15	—	0.35±0.15
2012 (0805)  [MCR/KTR/ESR/TRR] [PMR10]	**MCR10** **KTR10** **ESR10**	2.0±0.1	1.25±0.1	0.55±0.1	0.4±0.2 0.3±0.2	0.4±0.2
	TRR10				$0.43^{+0.15}_{-0.1}$	
	PMR10	2.0±0.15	1.2±0.15	0.42 to 0.28* ±0.15	—	0.75 to 0.35* ±0.15
3216 (1206)  [MCR/KTR/ESR/TRR] [PMR18]	**MCR18** **KTR18** **ESR18**	3.2±0.15	1.6±0.15	0.55±0.1	0.5±0.25 0.3±0.25	0.5±0.25
	TRR18				$0.69^{+0.2}_{-0.15}$	
	PMR18			0.42 to 0.28* ±0.15	—	1.15 to 0.6* ±0.15
3225 (1210)  [MCR/KTR/ESR] [PMR25]	**MCR25**	3.2±0.15	2.5±0.15	0.55±0.15	0.5±0.25	0.5±0.25
	KTR25			0.55±0.1	0.3±0.25	
	ESR25			0.55±0.15		
	PMR25	3.2±0.2	2.5±0.2	0.52 to 0.32* ±0.15	0.5±0.2	1.0 to 0.8* ±0.2
5025 (2010)  [MCR50] [PMR50]	**MCR50**	5.0±0.15	2.5±0.15	0.55±0.15	0.6±0.25	0.6±0.25
	PMR50	5.0±0.2	2.5±0.2	0.52 to 0.32* ±0.15	0.5±0.2	1.85 to 0.9* ±0.2
6432 (2512)  [MCR100] [PMR100]	**MCR100**	6.3±0.15	3.2±0.15	0.55±0.15	0.6±0.25	0.6±0.25
	PMR100	6.4±0.25	3.2±0.25	0.52 to 0.32* ±0.15	0.5±0.25	2.3 to 1.1* ±0.25

Note: Numbers in ( ) indicate the size in inches
*May vary depending on the resistance value. For additional details, please consult with a local sales representative.



∗ May vary depending on the resistance value. For additional details, please consult with a local sales representative.



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