

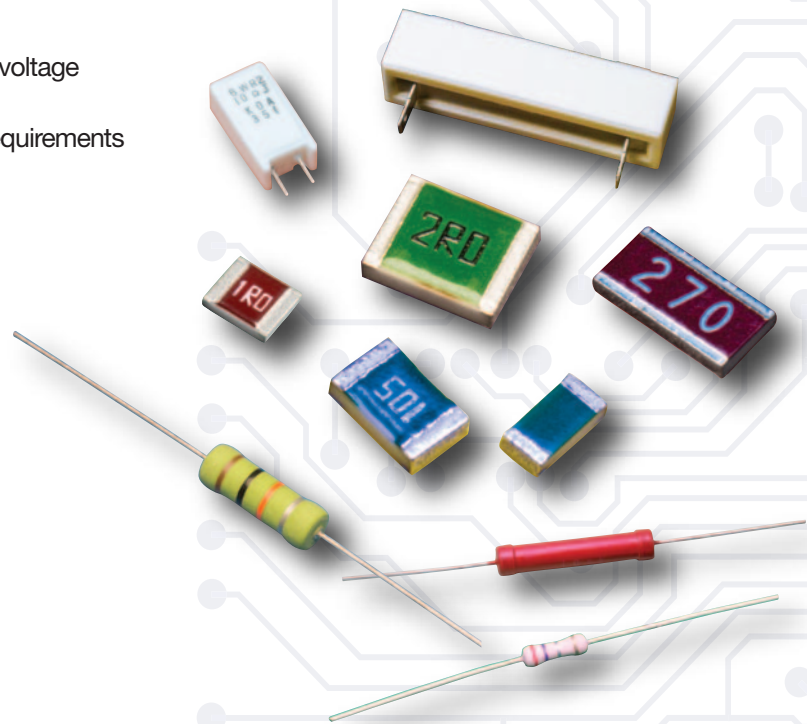
## Excellent Surge and Pulse Withstanding Voltage

### Features

- Superior to other resistors in surge/pulse withstanding voltage and high power
- Products with lead-free terminations meet EU RoHS requirements
- Most are AEC-Q200 tested

### Applications

- Automotive Electronics
- Industrial equipment
- Power Supply
- X-Ray CT (with the exception of BRGV/BSRV/BWRV)



## KOA Surge/Pulse Lineup

### Surface Mount (SMT)

**High Pulse Resistant**  
SG73\*

**High Precision**  
SG73G\*

**Pulse Resistant**  
SG73P\*

**Surge Retardant**  
SG73S\*

**Wide Terminal High Power Rating**  
WG73\*

### Through-hole

**Low Resistance**  
BGR/BGRV†

**High Resistance**  
BSRV†

**Precision**  
BWR/BWRV†

**Pulse Resistant Surge Resistant**  
HPC\*  
PCF\*

**Small Size Flame Retardant**  
MOS

\* AEC-Q200 tested

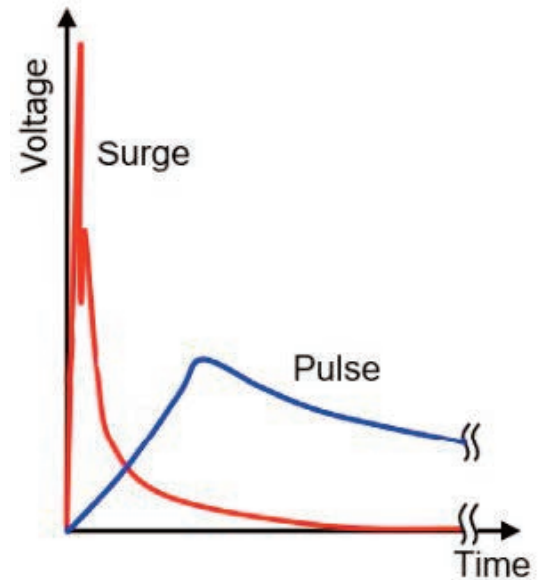
† Versions of resistors are AEC-Q200 tested

SG73, SG73P, and SG73S are also available in anti-sulfur

## Definition of Pulse and Surge

Circuits that need to limit an instantaneous flow of large current, and circuits subject to static electricity (electrostatic discharge or ESD), require the use of resistors that are resistant to pulse and surge.

In this diagram, an overload with high power and long duration (transferring high energy) is called a "pulse," and an overload with high voltage but short duration (such as ESD) is called a "surge."



	Voltage	Time	Energy
<b>Pulse</b>	Low	Long	High
<b>Surge (ESD)</b>	High	Short	Low

## Lineup of Pulse and Surge Resistant Resistors

Purpose	Item	Product Name	Series	Features
<b>Pulse Resistant</b>	SMD Type	Pulse resistant chip resistors	SG73	High pulse resistant
			SG73P	Pulse resistant (for general use)
			SG73G	High precision
			WG73	Wide terminal, high power rating
	Through-hole Type	Fixed metal oxide film resistors	MOS	Small size flame retardant
			Wire-wound resistors (in ceramic case)	BGR/V
Metal oxide film			BSR/V	High resistance
		Wire-wound resistors (in ceramic case)	BWR/V	High power rating
		Ceramic resistor	HPC/PCF	Pulse resistant/surge resistant
<b>Surge Resistant</b>	SMD Type	Surge resistant chip resistors	SG73	High surge resistant
			SG73S	Surge resistant (for general use)
			WG73	Wide terminal, high power rating

# Applications & Ratings

## High Pulse Resistant

### SG73

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (E-12) (K±10%, M±20%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
SG731J (0603)	0.1W	70°C	125°C	±400	1Ω - 8.2Ω	50V	100V	-55°C to +155°C
				±200	10Ω - 1MΩ			
SG732A (0805)	0.125W		125°C	±400	1Ω - 8.2Ω	150V	200V	
				±200	10Ω - 1MΩ			
SG732B (1206)	.33W		125°C	±400	1Ω - 8.2Ω	200V	400V	
				±200	10Ω - 1MΩ			
SG732E (1210)	0.5W		125°C	±400	1Ω - 8.2Ω	200V	400V	
		±200		10Ω - 1MΩ				
SG732H/W2H (2010)	0.75W	125°C	±400	1Ω - 8.2Ω	200V	400V		
			±200	10Ω - 1MΩ				
SG733A/W3A (2512)	1W	125°C	±400	1Ω - 8.2Ω	200V	400V		
			±200	10Ω - 1MΩ				

Parentheses indicate EIA package size codes. Rated voltage =  $\sqrt{\text{Power rating} \times \text{resistance value}}$  or max. working voltage, whichever is lower. If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

## High Precision

### SG73G

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) C±0.25%, D±0.5% E-24/E-96	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
SG73G1J (0603)	0.2W	70°C	125°C	±50	10 - 1M	150V	200V	-55°C to +155°C
	0.33W*1		125°C					
SG73G2A (0805)	0.25W		125°C	±50	10 - 1M	200V	400V	
	0.5W*1		100°C					
SG73G2B (1206)	0.33W		125°C	±50	10 - 1M	200V	400V	
	0.5W*1		120°C					

Parentheses indicate EIA package size codes. Rated voltage =  $\sqrt{\text{Power rating} \times \text{resistance value}}$  or max. working voltage, whichever is lower. If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. \*1 If you want to use the rated power of \*1, please use the derating curve based on the terminal part temperature on the previous page.

# Applications & Ratings

## Pulse Resistant (for general use)

### SG73P

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)			Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
					(E-24)/E-96 (D±0.5%)	(E-24)/E-96 (F±1%)	(E-24) (G±2%, J±5%)			
NEW SG73P1E (0402)	0.125W	70°C	125°C	±200	10 - 1M	1 - 1M	1 - 10M	75V	100V	-55°C to +155°C
	0.2W*2		105°C							
SG73P1EW (0402)	0.25W*2		125°C	±100	10 - 1M	10 - 1M	10 - 1M	75V	100V	
				±200	—	1 - 9.76	1 - 9.1 1.1M - 10M			
SG73P1J (0603)	0.2W		135°C	±100	510 - 576k	510 - 576k	510 - 560k	150V	200V	
				±100*1	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M			
	±100			510 - 576k	510 - 576k	510 - 560k				
				10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M				
SG73P2A (0805)	0.25W		125°C	±100	100 - 100k	100 - 100k	100 - 100k	400V	600V (800V)*3	
	0.5W*2			±200	10 - 97.6 102k - 1M	1 - 97.6 102k - 1M	1 - 91 110k - 10M			
					100°C	±100	100 - 100k			
SG73P2B (1206)	0.33W		125°C	±100	300 - 1M	300 - 1M	300 - 1.1M	200V	400V	
		±200			10 - 294	1 - 294	1 - 270 1.2M - 10M			
	±100			300 - 1M	300 - 1M	300 - 1.1M				
		0.75W*2		105°C	±200	10 - 294	1 - 294			1 - 270 1.2M - 10M
±100	10 - 97.6 102k - 1M		1 - 97.6 102k - 1M			1 - 91 110k - 10M				
	SG73P2E (1210)	0.5W	125°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	
0.75W*2		110°C								
SG73P2E1 (1210)	1.0W*2	95°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V		

Parentheses indicate EIA package size codes. \*1 Cold T.C.R. (-55°C ~ +25°C) is +150 x 10<sup>-6</sup>/K Rated voltage = √Power rating x resistance value or max. working voltage, whichever is lower. Please contact KOA Speer for how to handle a specific surge/pulse. If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. \*2 Rated power derating applies only if permitted Terminal Part Temp is not exceeded. \*3 Applies when power rating is 0.4W or lower.

## Surge Resistant

### SG73S

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)			Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
					(E-24)/E-96 (D±0.5%)	(E-24)/E-96 (F±1%)	(E-24) (G±2%, J±5%)			
SG73S1E (0402)	0.125W	70°C	125°C	±200	10 - 1M	1 - 1M	1 - 10M	75V	100V	-55°C to +155°C
	0.2W*2		105°C							
SG73S1J (0603)	0.2W		135°C	±100	510 - 576k	510 - 576k	510 - 560k	150V	200V	
				±100*1	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M			
	±100			510 - 576k	510 - 576k	510 - 560k				
				±100*1	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M			
SG73S2A (0805)	0.25W		125°C	±200	10 - 1M	1 - 1M	1 - 10M	400V	600V (800V)*3	
	0.5W*2									
SG73S2B (1206)	0.33W		125°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	
	0.75W*2									
SG73S2E (1210)	0.5W		125°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V	
	0.75W*2									
SG73S2E1 (1210)	1W	95°C	±200	10 - 1M	1 - 1M	1 - 10M	200V	400V		

Parentheses indicate EIA package size codes.

\*1 Cold T.C.R. (-55°C ~ +25°C) is +150 x 10<sup>-6</sup>/K

Rated voltage = √Power rating x resistance value or max. working voltage, whichever is lower

Please contact KOA Speer for how to handle a specific surge/pulse

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature"

in the beginning of the catalog. \*2 If you want to use the rated power of \*2, \*3 please reference below. \*3 Applies when power rating is 0.4W or lower.

# Applications & Ratings

## Wide Terminal High Power Rating

### WG73

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10 <sup>-6</sup> /K)	Resistance Range (Ω)		Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
					K±10% E-12	M±20% E-12			
WG732B	1.0W	70°C	±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C
WG732H	1.5W		±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	
WG733A	2.0W		±125°C	±100	560m ~ 1k	560m ~ 1k	200V	400V	

### Low Resistance Wirewound with Glass Core BGR/BGRV

### High Resistance Metal Oxide Film BSR/BSRV

### Precision Wirewound with Ceramic Core BWR/BWRV

Type	Power Rating	Resistance Range (Ω) E24				Style & Weight (g/1 piece)													
		F±1%	G±2%	J±5%	K±10%	S	N	E	P	X	Y	YS	Z	H	Q	HA	HB	QA	QB
BWR1	1W	1~56	0.22~75	0.1~75	—	1.3	—	—	—	—	—	—	—	—	—	—	—	—	—
BWR2	2W	1~160	0.22~200	0.1~200	—	2.1	3.9	—	—	—	—	—	—	—	—	—	—	—	—
BWR3	3W	1~300	0.22~390	0.1~390	—	3.9	5.9	—	—	—	—	—	—	—	—	—	—	—	—
BWR5	5W	1~300	0.22~390	0.1~390	—	5.1	7.2	5.7	5.6	—	—	—	—	—	—	—	—	—	—
BWR7	7W	1~360	0.22~390	0.1~390	—	7.5	10.8	—	—	—	—	—	—	—	—	—	—	—	—
BWR10	10W	1~390	0.22~390	0.1~390	—	10.2	15.0	—	—	—	—	—	—	—	—	—	—	—	—
BWR15	15W	1~390	0.22~390	0.1~390	—	18.8	—	—	—	—	—	—	—	—	—	—	—	—	—
BWR20	20W	1~390	0.22~390	0.1~390	—	23.3	—	—	—	—	—	—	—	—	—	—	—	—	—
BGR5	5W	—	—	10~390	0.39~9.1	—	—	—	—	6.1	7.6	6.6	7.6	—	6.2	—	—	—	—
BGR7	7W	—	—	10~390	0.39~9.1	—	—	—	—	8.2	9.1	7.8	9.1	—	7.8	—	—	—	—
BGR10	10W	—	—	10~390	0.39~9.1	—	—	—	—	11.0	12.4	10.4	11.4	9.9	10.7	13.6	—	14.5	—
BGR15	15W	—	—	10~390	0.51~9.1	—	—	—	—	18.8	—	—	20.5	18.4	18.6	24.4	27.5	24.6	27.7
BGR20	20W	—	—	10~390	0.51~9.1	—	—	—	—	22.3	—	—	24.0	21.9	22.1	27.9	31.0	28.1	31.3
BGR30	30W	—	—	10~390	2.2~9.1	—	—	—	—	—	—	—	—	59.3	59.6	73.9	73.5	74.2	73.8
BGR40	40W	—	—	10~390	2.2~9.1	—	—	—	—	—	—	—	—	70.4	70.6	85.0	84.6	85.2	84.8
BSR2	2W	—	—	430~13k	—	2.1	3.8	—	—	—	—	—	—	—	—	—	—	—	—
BSR3	3W	—	—	430~27k	—	3.9	5.9	—	—	—	—	—	—	—	—	—	—	—	—
BSR5	5W	—	—	430~51k	—	5.1	7.2	5.7	—	6.1	7.6	6.6	7.6	—	6.2	—	—	—	—
BSR7	7W	—	—	430~56k	—	7.4	10.8	—	—	8.2	9.1	7.8	9.1	—	7.8	—	—	—	—
BSR10	10W	—	—	430~75k	—	10.2	15.0	—	—	11.0	12.4	10.4	11.4	10.9	10.7	13.7	—	14.5	—
BSR15	15W	—	—	430~56k	—	18.8	—	—	—	18.5	—	—	20.5	18.4	18.6	24.4	27.5	24.6	27.7
BSR20	20W	—	—	430~56k	—	23.3	—	—	—	22.0	—	—	24.0	21.9	22.1	27.9	31.0	28.1	31.3

Type	Power Rating	Max. Working Voltage (V)		Max. Overload Voltage (V)		T.C.R. (x10 <sup>-6</sup> /K)			Rated Ambient Temperature	Operating Temperature Range
		BSR	BGR,BWR	BSR	BGR,BWR	BWR	BSR	BGR		
BWR1	1W	—	E=√P•R	—	E=√P•R•10	±100	±300	±250	+70°C	-40°C to +155°C
B□R2	2W	250		500						
B□R3	3W	300		600						
B□R5	5W	350		700						
B□R7	7W	500		1000						
B□R10	10W	700		1400						
B□R15	15W	700		1400						
B□R20	20W	750		1500						
BGR30	30W	—		—						
BGR40	40W	—		—						
									+25°C	

Rated voltage= √Power Rating x Resistance value or Max. working voltage, whichever is lower.

□ Represents the space to designate product type via character G, W, or S.

Please consult with us in advance about custom-made products.

# Applications & Ratings

**Low Resistance**  
Wirewound with Glass Core  
BGR/BGRV

**High Resistance**  
Metal Oxide Film  
BSR/BSRV

**Precision**  
Wirewound with Ceramic Core  
BWR/BWRV

Type	Power Rating	Pulse Energy Capacity (J)*	Resistance Range (Ω) E24		Style & Weight (g/1pcs)					
			J±5%	K±10%	S**	N**	Q	QA	QC	QE
BWRV3	3W	11	1~390	—	3.9	5.9	—	—	—	—
BWRV5	5W	17	1~390	—	5.1	7.2	—	—	—	—
BWRV7	7W	52	1~390	—	7.5	10.8	—	—	—	—
BWRV10	10W	100	1~390	—	10.2	15.0	—	—	—	—
BWRV15	15W	100	1~390	—	18.8	—	—	—	—	—
BWRV20	20W	180	1~390	—	23.3	—	—	—	—	—
BWRV40	40W (60W)	549	4.3~220	—	—	—	93.5	—	—	—
BGRV5	5W	16	10~390	5.1~9.1	—	—	6.2	—	—	—
BGRV7	7W	31	10~390	5.1~9.1	—	—	7.9	—	—	—
BGRV10	10W	60	10~390	5.1~9.1	—	—	10.7	14.5	—	—
BGRV15	15W	60	10~390	5.1~9.1	—	—	18.6	24.6	—	—
BGRV20	20W	95	10~390	5.1~9.1	—	—	22.1	28.1	—	—
BGRV30	30W	161	10~390	5.1~9.1	—	—	59.6	—	84.6	73.9
BGRV30TQW			10~100	5.1~9.1	—	—				
BGRV40	40W	226	10~390	5.1~9.1	—	—	70.6	—	105.0	95.0
BGRV40TQW			10~100	5.1~9.1	—	—				
BSRV3	3W	—	430~27k	—	3.9	5.9	—	—	—	—
BSRV5	5W	—	430~51k	—	5.1	7.2	6.2	—	—	—
BSRV7	7W	—	430~56k	—	7.5	10.8	7.9	—	—	—
BSRV10	10W	—	430~75k	—	10.2	15.0	10.7	14.5	—	—
BSRV15	15W	—	430~56k	—	18.8	—	18.6	24.6	—	—
BSRV20	20W	—	430~56k	—	23.3	—	22.1	28.1	—	—

\* Average value between 10Ω~100Ω

\*\* S Style and N Style lead terminal products are not compatible with the AEC-Q200 vibration test by only soldered PCB mounting.

When using the product, please take into account vibration measures such as fixing the product with silicone resin.

Type	Power Rating	Rated Ambient Temp.	Max. Working Voltage (V)			Max. Overload Voltage (V)			T.C.R. (x10 <sup>-6</sup> /K)			Operating Temperature Range		
			BGRV	BWRV	BSRV	BGRV	BWRV	BSRV	BGRV	BWRV	BSRV			
B□RV3	3W	+70°C	—	E=√P•R	300	—	E=√P•R•10	600	±250	±300	-40°C to +155°C			
B□RV5	5W		350		—	700								
B□RV7	7W		500		—	1000								
B□RV10	10W		700		—	1400								
B□RV15	15W		700		—	1400								
B□RV20	20W		750		—	1500								
BGRV30	30W	+25°C	—	—	—	—	—	±250	—	-40°C to +155°C				
BGRV40	40W		—		—	—								
BWRV40	40W (60W)***		—		E=√P•R	—	E=√P•R•10					—	—	±250

Rated voltage= √Power Rating x Resistance value or Max. working voltage, whichever is lower.

Please consult with us in advance about custom-made products.

\*\*\* Please note that when used at a rated power of 60W, the surface temperature of the product will reach approximately 300°C.



# Applications & Ratings

## Pulse Resistant Surge Resistant

### HPC PCF

Part Designation	Power Rating @ 40°C	Resistance Range (Ω)		T.C.R. (x10 <sup>-6</sup> /K)	Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temp.	Operating Temp. Range
		K: ±10% E-12	M: ±20% E-6					
HPC1/2	0.5W	10 - 390K	3.3 - 330K	-500 ~ -1300: 3.3Ω≤R<10Ω	200V	400V	+40°C	-40°C to +200°C
HPC1	1.0W			-600 ~ -1500: 10Ω≤R<100Ω	300V	600V		
HPC2	2.0W			-700 ~ -1800: 100Ω≤R<1kΩ	400V	800V		
HPC3	3.0W			-900 ~ -1900: 1kΩ≤R<100kΩ	450V	900V		
HPC4	4.0W			-900 ~ -2000: 100kΩ≤R<200kΩ	500V	1000V		
HPC5	5.0W			-900 ~ -2200: 200kΩ≤R<390kΩ	550V	1100V		

Rated voltage = √Power Rating X Resistance Value or Max. working voltage, whichever is lower

Part Designation	Power Rating @ 70°C	Resistance Range (Ω)		T.C.R. (x10 <sup>-6</sup> /K)	Maximum Working Voltage	Maximum Overload Voltage	Dielectric Withstanding Voltage	Rated Ambient Temp.	Operating Temp. Range
		K: ±10% E-12	M: ±20% E-6						
PCF1/2	0.5W	4.7 - 100K	4.7 - 100K	-500 ~ -1300: 3.3Ω≤R<10Ω -600 ~ -1500: 10Ω≤R<100Ω -700 ~ -1800: 100Ω≤R<1kΩ -900 ~ -1900: 1kΩ≤R<100kΩ -900 ~ -2000: 100kΩ≤R<200kΩ -900 ~ -2200: 200kΩ≤R<390kΩ	200V	400V	500V	+70°C	-40°C to +200°C
PCF1	1.0W	3.3 - 390K	3.3 - 390K	300V	600V				
PCF2	2.0W			400V	800V	700V			

Rated Voltage = √Power Rating x Resistance Value or Max. working voltage, whichever is lower

## Small Size Flame Retardant

### MOS

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C) Max.	Resistance Range			Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range
				E-24, E-96* (F±1%)	E-24* (G±2%)	E-24 (J±5%)			
MOS1/2	0.5W	400V	±300	10Ω - 47kΩ	10Ω - 47kΩ	10Ω - 47kΩ	E = √P x R	600V	-55°C to +200°C
MOS1	1.0W	500V		10Ω - 68kΩ	10Ω - 68kΩ	10Ω - 100kΩ			
MOS2	2.0W			10Ω - 100kΩ	10Ω - 100kΩ		500V	1000V	
MOS3	3.0W	700V		—	10Ω - 100kΩ	10Ω - 100kΩ			
MOS5	5.0W	800V		—	10Ω - 100kΩ	10Ω - 100kΩ			
MOSX1/2	0.5W	400V		1Ω - 9.1Ω	0.22Ω - 9.1Ω	0.1Ω - 9.1Ω	E = √P x R	E x 2.5	
MOSX1	1.0W	500V		1Ω - 9.1Ω	0.22Ω - 9.1Ω				
MOSX2	2.0W			700V	—	0.22Ω - 9.1Ω	0.22Ω - 9.1Ω		
MOSX3	3.0W	700V		—	0.22Ω - 9.1Ω	0.22Ω - 9.1Ω			
MOSX5	5.0W	800V		—	0.22Ω - 9.1Ω	0.22Ω - 9.1Ω			

\* Please consult when there is a demand of the resistance besides the 1% and 2% range.