



Thin Film Technology Corp.

Product Guide

Automotive Technology

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

























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Current Sense Resistors + Jumpers























































4-Terminal	Separate Voltage & Current Terminals, High Heat Dissipation	CPA											
			0612										
2-Terminal	High Precision, Separate Voltage & Current Terminals, Low TCR	WRL											
			1206	2512									
	High Power & Small Size, High Heat Dissipation	MPA											
			1206	2512									
	Low Height Profile	MPC											
			0201	0402	0603	0805	1206						
	General Purpose Current Sensing, Wrapped Electrodes	WEL Short-Side											
		0603	0805	1206	2010	2512							
	General Purpose Current Sensing, Wrapped Electrodes, High Power & Small Size	WEL Long-Side											
			0508	0612	0815	1020	1225	0830	1530	1836	2043		
Jumper	High Current	LPC											
			01005	0201	0402	0603	0805	1206					

English case sizes shown.

Applications

- Engine Control Unit
- BMS
- DC/DC Converter
- Infotainment Cluster
- Digital Display
- ADAS

Thin and Thick Film Resistors

Thin Film	Low TCR and Tolerance	KN_A									
	Low Ohm	KU_A Short-Side									
		KU_A Long-Side									
Thick Film	High-Grade Anti-Sulfur	KGAS Short-Side									
		KGAS Long-Side									
	High Power	KHA									
	Ultra High Power	KHAP									
	General Purpose	TFA									
	Wide Terminal General Purpose	TFAW									

English case sizes shown.

Applications

- Wiper System
- Surround Sound
- Keyless Entry System
- Navigation/GPS
- Lighting System
- Tire Pressure System

CPA

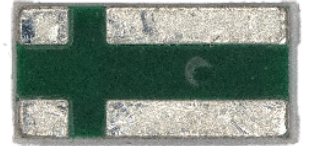
Current Sensing Resistor

Construction

- High purity alumina ceramic
- Nickel alloy foil resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfur

Features

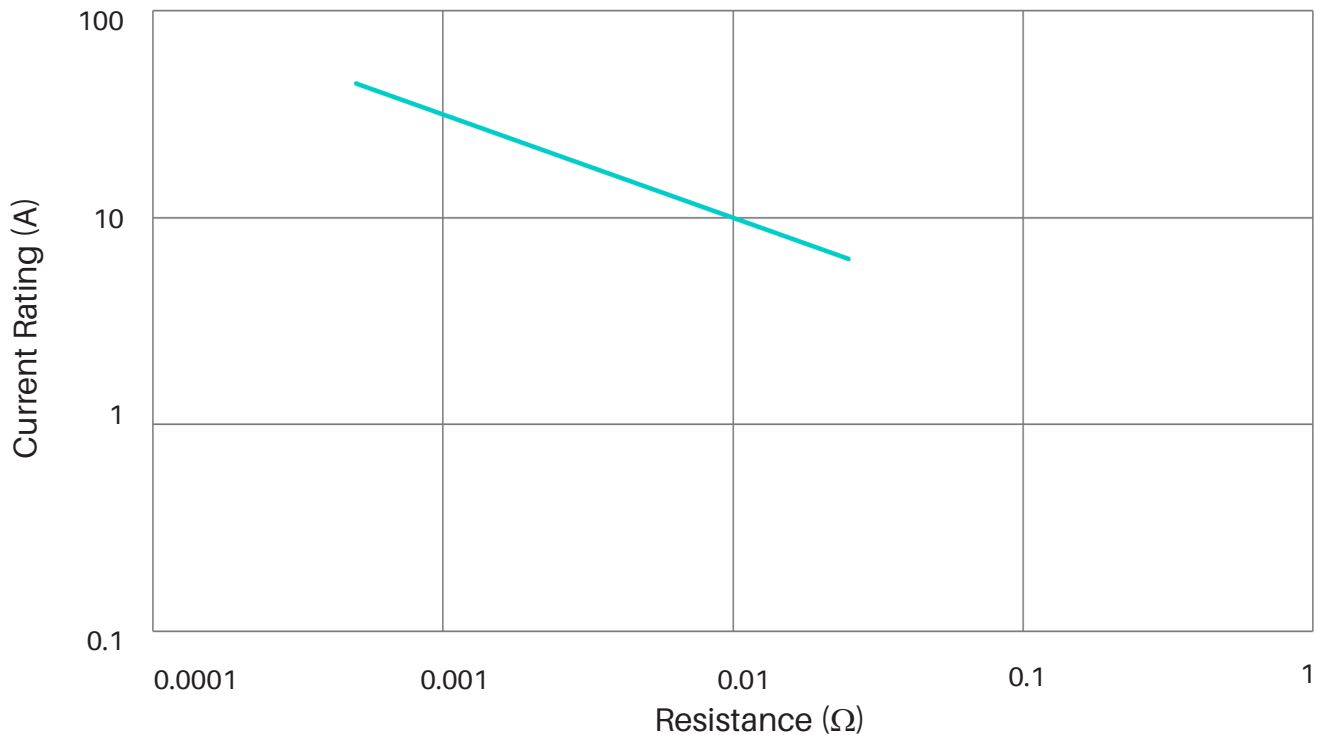
- 0612 English case size
- Power of 1W
- Resistance ranges from 0.5mΩ~25mΩ
- TCR down to ±50ppm/°C
- Tolerance down to ±1.0%
- AEC-Q200 Qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specification				
Case Size*	0612			
Power Rating	1W			
Resistance Range (mΩ)	±0.5%	5~25	-	
	±1.0%		1~4	0.5, 0.75
TCR ±ppm/°C	50	100	150	200
Operating Temp. Range	-55 °C~+155 °C			

*Case size color reflected in chart

Max Current Rating vs Resistance



WRL-L4

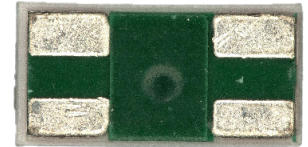
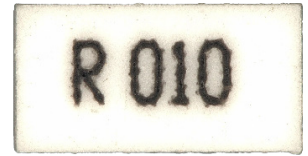
Current Sensing Resistor

Construction

- High purity alumina ceramic
- MnCu resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfur

Features

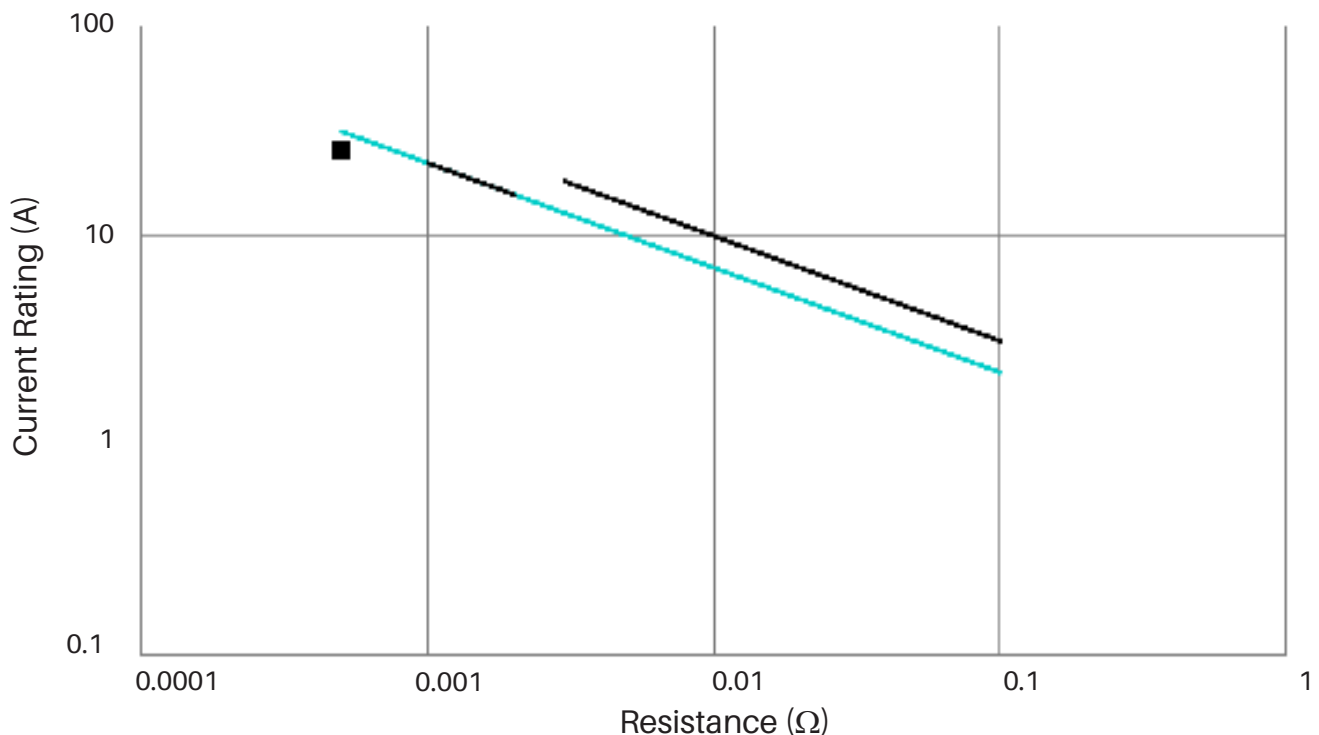
- 1206, 2512 English case sizes
- Power rating up to 1W
- Resistance from 0.5mΩ~100mΩ
- TCR down to ±30ppm/°C
- Tolerance down to ±0.3%
- AEC-Q200 Qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications								
Case Size*	1206				2512			
Power Rating	1/2W				1/3W	1/2W	1W	
Resistance Range (mΩ)	±0.3%	10~100	-		-	-	-	
	±0.5%		5~9	1~4	-	0.5	1~2	3~4
	±1.0%	-	-	-	0.5	0.5	1~2	3~4
TCR ±ppm/°C	30	50	75	100	100	75	50	30
Operating Temp. Range	-55 °C~+155 °C							

*Case size color reflected in chart

Max Current Rating vs Resistance



MPA

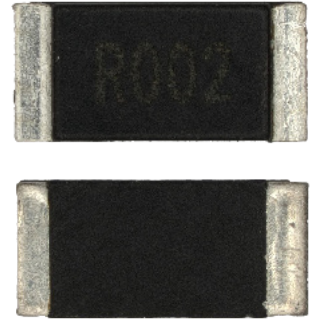
Current Sensing Resistor

Construction

- Epoxy-resin overcoat
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfur

Features

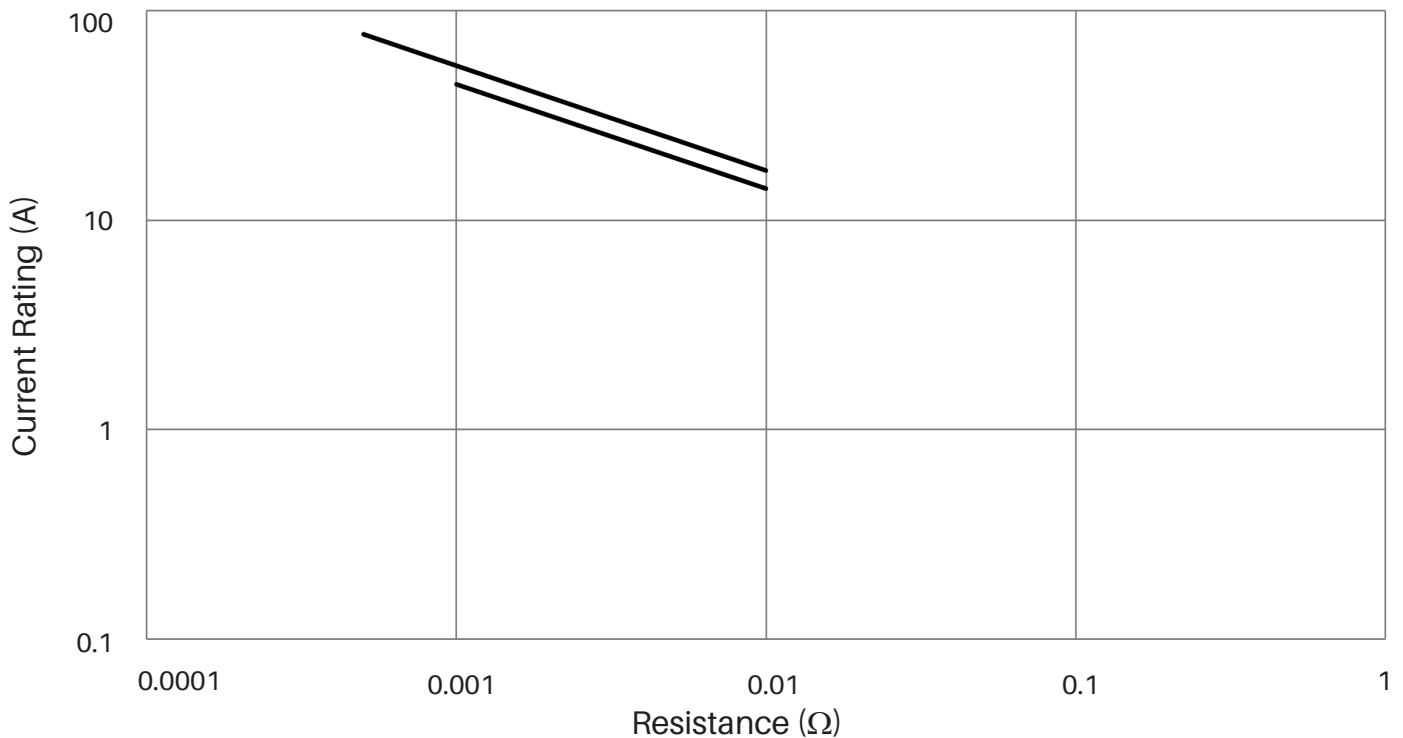
- 2512 English case size
- Resistance from 0.5mΩ~10mΩ
- Power up to 3W
- TCR down to ±50ppm/°C
- Tolerance of ±1.0%
- AEC-Q200 qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications						
Case Size*		2512				
Power Rating		2W		3W		
Resistance Range (mΩ)	±1.0%	1	2~10	0.5, 0.75	1	2~10
TCR ±ppm/°C		100	50	150	100	50
Operating Temp. Range		55 °C~+170°C				

*Case size color reflected in chart

Max Current Rating vs Resistance



MPC

Current Sensing Resistor

Construction

- Metal foil resistive element
- Epoxy-resin overcoat
- Non-wrapped electrodes
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfur

Features

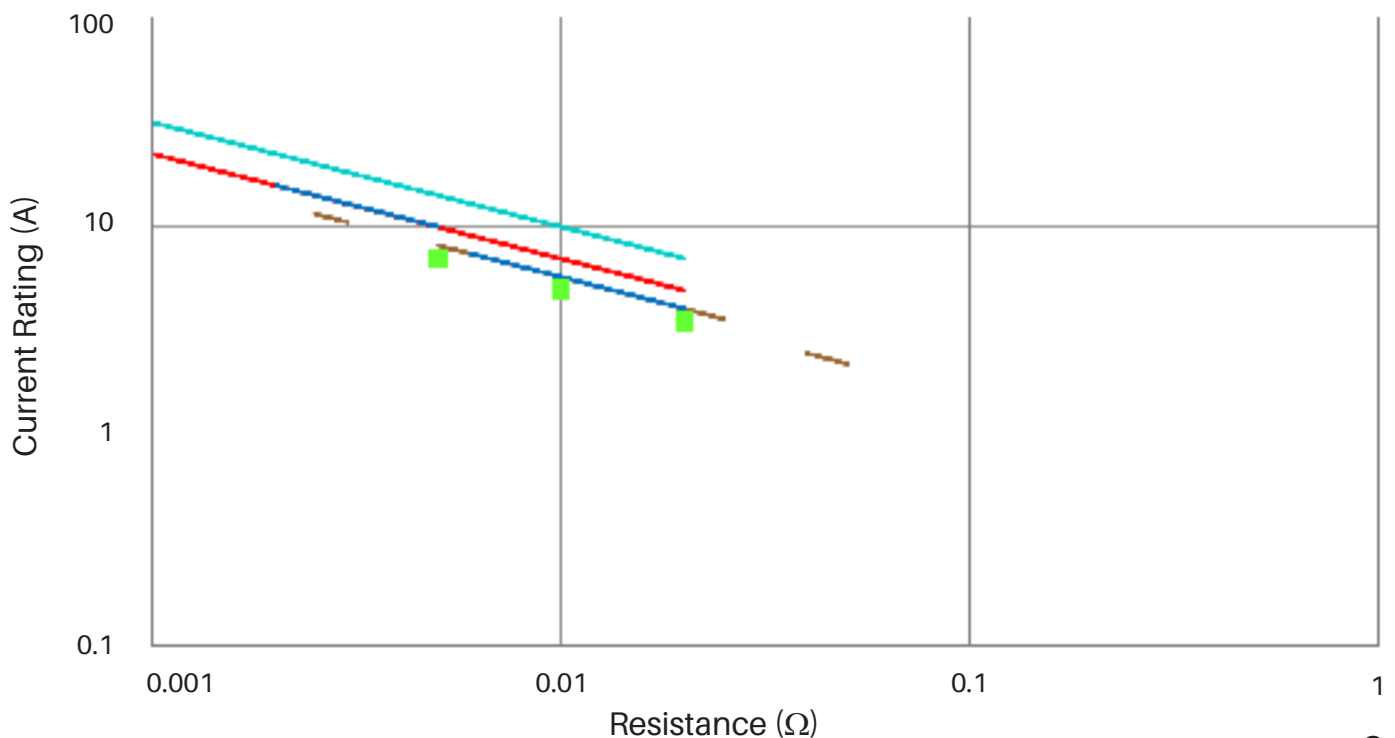
- 0201, 0402, 0603, 0805, 1206 English case size
- Power up to 1W
- Resistances from 1mΩ~50mΩ
- TCR down to ±50ppm/°C
- Tolerance down to ±0.5%
- Low Profile(0201: 0.014in max.; 0402: 0.016in max.; 0603: 0.022in max.; 0805-1206: 0.024in max.)
- AEC-Q200 qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications																
Case Size*		0201			0402			0603			0805				1206	
Power Rating		1/4W			1/3W	1/4W	1/2W	1/3W	1/2W				1W			
Resistance Range (mΩ)	±2.0%	5	10	20	2.5~3	5~25	40~50	2	2.5~5	6~20	1	1.5	2~5	6~20	1~4	5~20
	±1.0%															
TCR ±ppm/°C		200	100	150	100		150	100	75	150	100	75	50	75	50	
Operating Temp. Range		-55 °C~+155 °C														

*Case size color reflected in chart

Max Current Rating vs Resistance



WEL Short Side

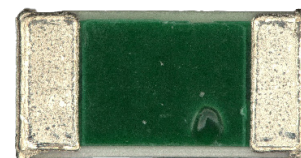
Current Sensing Resistor

Construction

- High purity alumina ceramic
- Metal foil resistive element
- Epoxy-resin overcoat
- 100% Matte tin over Ni terminations
- Halogen Free
- RoHS complainant and Pb free
- Inherently Anti-Sulfur

Features

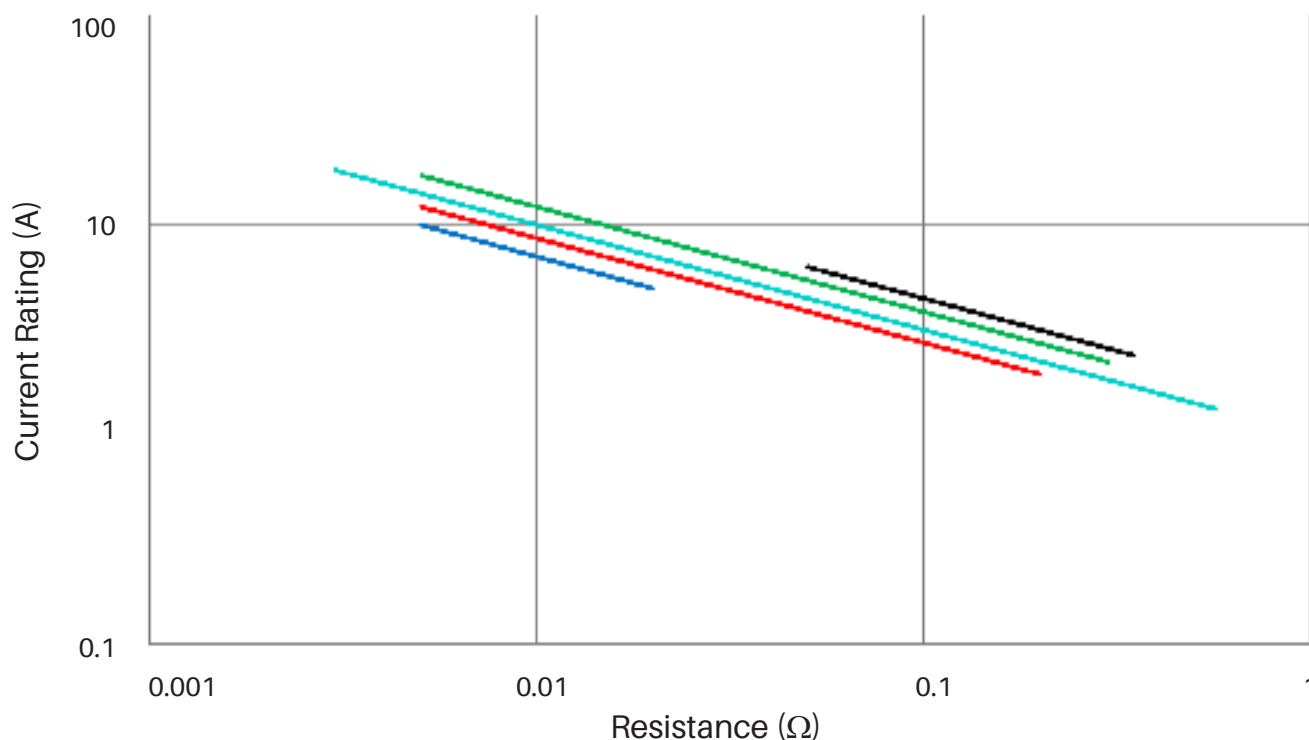
- 0603, 0805, 1206, 2010, 2512 English case size
- Power up to 2W
- Resistances from 3mΩ~570mΩ
- TCR down to ±50ppm/°C
- Tolerance down to ±0.5%
- AEC-Q200 Qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications															
Case Size*	0603		0805		1206		2010		2512						
Power Rating	1/2W		3/4W		1W		1.5W		2W						
Resistance Range (mΩ)	±0.5%	-	10~20		-	10~200		-	10~570		-	10~300		50~350	
	±1.0%	5~9			5~9			3~9			5~9				
TCR ±ppm/°C	100	50	100	50	100	50	100	50	100	50	100	50	100	50	
Operating Temp. Range	-55 °C~+155 °C														

*Case size color reflected in chart

Max Current Rating vs Resistance



WEL Long Side

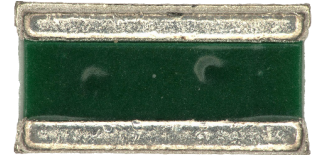
Current Sensing Resistor

Construction

- High purity alumina ceramic
- Metal foil resistive element
- Epoxy-resin overcoat
- 100% Matte tin over Ni terminations
- Halogen Free
- RoHS complainant and Pb free
- Inherently Anti-Sulfur

Features

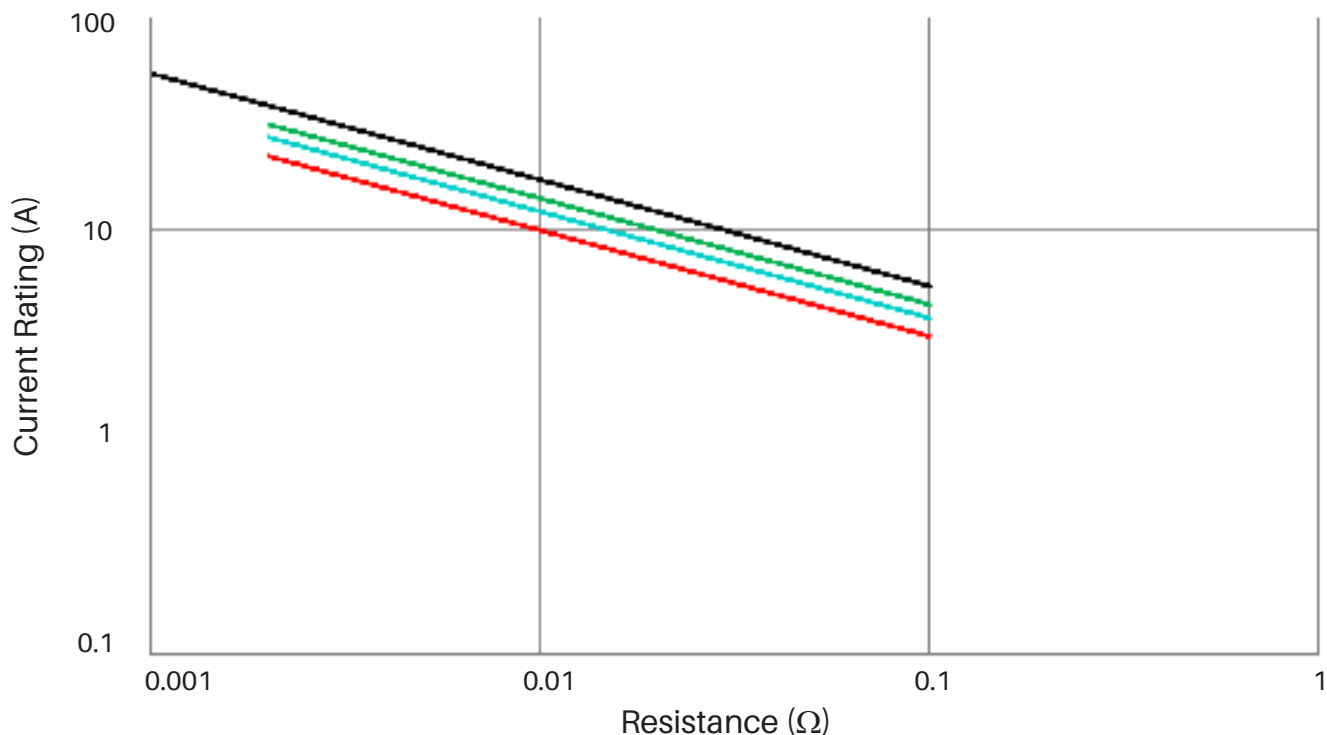
- 0508, 0612, 1225, 0830 English case size
- Power up to 3W
- Resistances from 1mΩ~100mΩ
- TCR down to ±50 ppm/°C
- Tolerance down to ±0.5%
- AEC-Q200 Qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications											
Case Size*		0508	0612	1020	1225	0830					
Power Rating		1W		1.5W		2W		3W			
Resistance Range (mΩ)	±0.5%	-	10~100	-	10~100	-	10~100	-	10~100	-	10~100
	±1.0%	2~9		2~9		2~9		1~9		1~9	
TCR ±ppm/°C		100	50	100	50	100	50	100	50	100	50
Operating Temp. Range		-55 °C~+155 °C									

*Case size color reflected in chart

Max Current Rating vs Resistance



LPC

Current Sensing Jumper

Construction

- Cu metal foil resistive element
- Epoxy-resin overcoat
- Non-wrapped terminations
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfur

Features

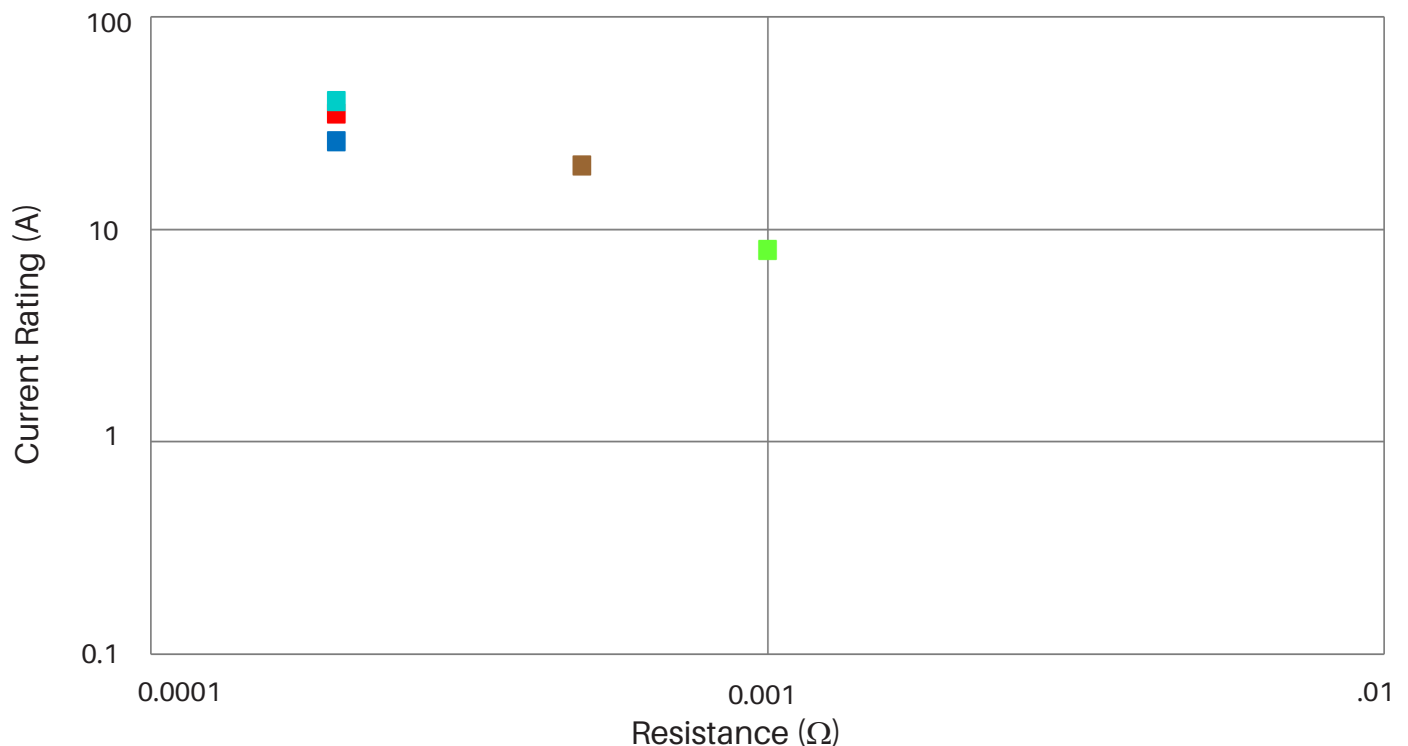
- 0201, 0402, 0603, 0805, 1206 English case size
- Max resistance of up to 1m Ω
- Max current up to 40 Amps
- Low profile (0201: 0.008in max.; 0402: 0.018in max.; 0603: 0.022in max.; 0805-1206: 0.024in max.)
- AEC-Q200 qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications					
Case Size*	0201	0402	0603	0805	1206
Max Current	8 Amps	20 Amps	26 Amps	35 Amps	40 Amps
Resistance Value (m Ω Max)	1	0.5	0.2		
Operating Temp. Range	-55 °C~+155 °C		-55 °C~+170 °C		

*Case size color reflected in chart

Max Current Rating vs Resistance



KN_A

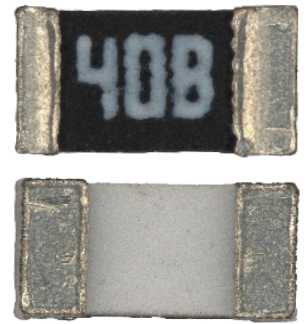
Thin Film Chip Resistor

Construction

- High purity alumina ceramic
- Ni alloy thin film resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free

Features

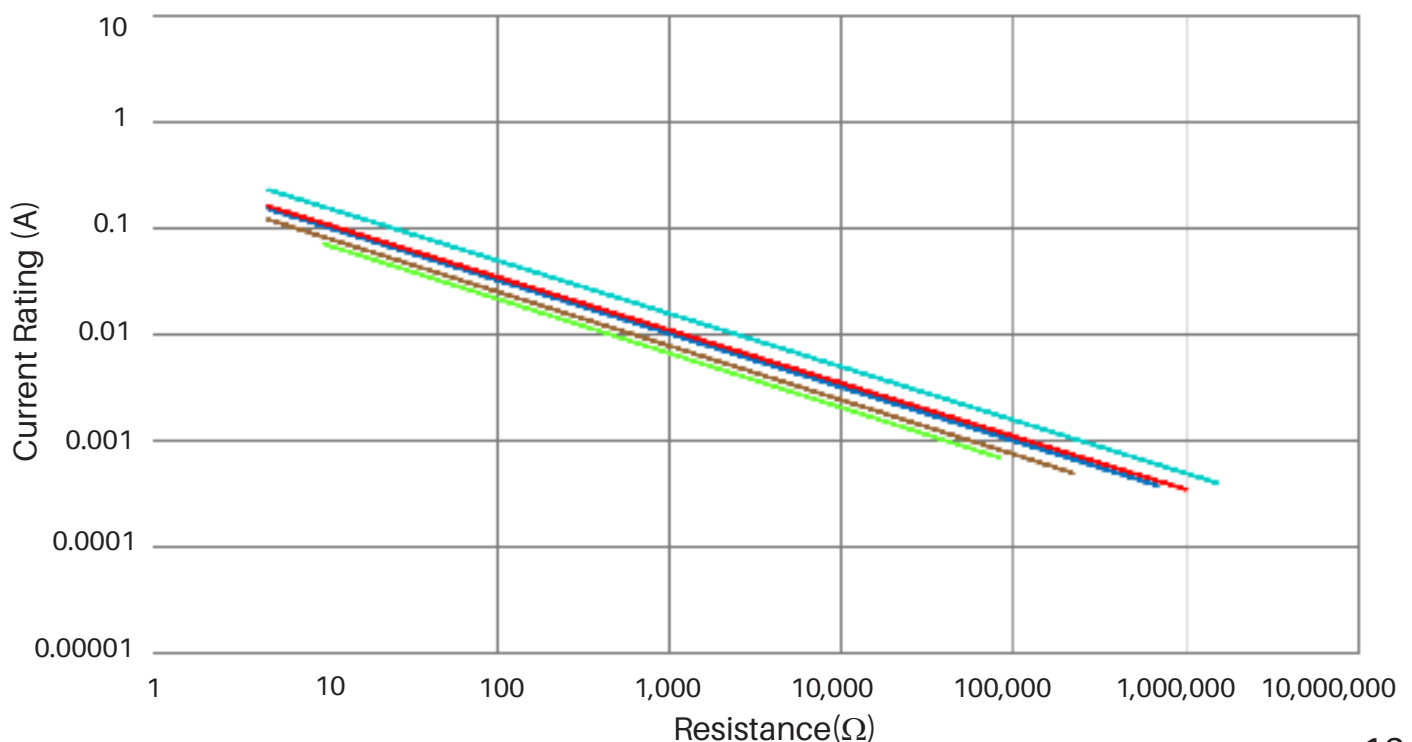
- 0201, 00402, 0603, 0805, 1206 English case size
- Power up to 1/4W
- Resistance from 4.7Ω ~ 1.5MΩ
- TCR down to ±10ppm/°C
- Tolerance down to ±0.05%
- AEC-Q200 qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications												
Case Size*	0201			0402		0603		0805		1206		
Power Rating	1/20W			1/16W		1/10W		1/8W		1/4W		
Resistance Range (Ω)	±0.05%	-	-	49.9~12K		49.9~30K		49.9~50K		49.9~100K		
	±0.10%	10~<49.9	49.9~5.1K	>5.1K~82K	10~68K	4.7~220K	10~332K	4.7~680K	10~680K	4.7~1M	10~1M	4.7~1.5M
	±0.25%											
	±0.5%											
	±1.0%											
TCR ±ppm/°C	10,15,25,50	25,50	10,15	25,50	10,15	25,50	10,15	25,50	10,15	25,50		
Operating Temp. Range	-55 °C~+155 °C											

*Case size color reflected in chart

Max Current Rating vs Resistance



KU_A Short Side

Low Ohm Thin Film Resistor

Construction

- High purity alumina ceramic
- Metal plate resistive element
- Epoxy-resin overcoat
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfur

Features

- 0201, 0402, 0603, 0805, 1206, 1210, 2010, 2512 English case size
- Power up to 3W
- Resistances from 10mΩ~10Ω
- TCR down to ±50ppm/°C
- Tolerance down to ±0.25%
- AEC-Q200 qualified
- Moisture sensitivity level (MSL) = 1

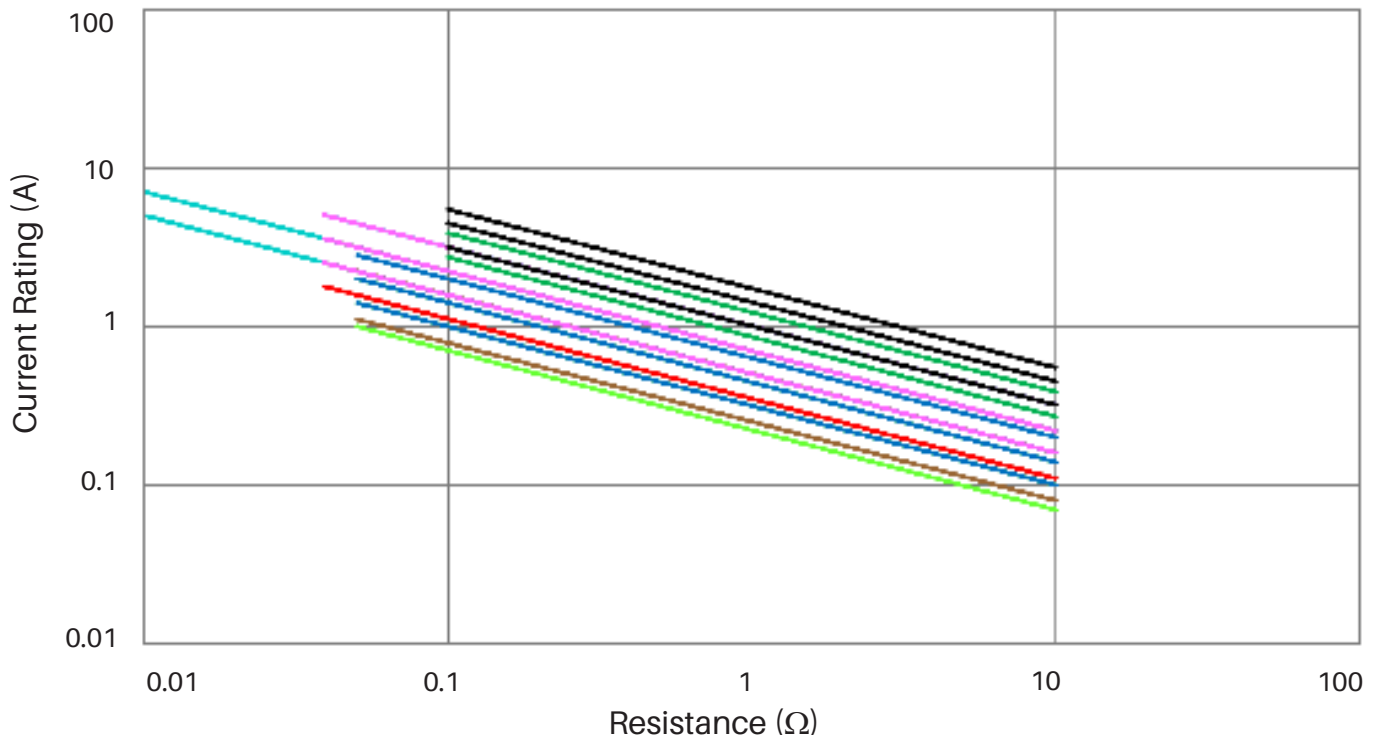


Electrical Specifications															
Case Size*	0201			0402			0603			0805					
Power Rating	1/20W	1/10W	1/5W	1/16W	1/8W	1/4W	1/10W	1/5W	2/5W	1/8W	1/4W	1/2W			
Resistance Range (Ω)	50m~10						39m~10								
Resistance Tolerance %	±0.5%, ±1.0%, ±2.0%, ±5.0%														
TCR ±ppm/°C	50mΩ~99mΩ			100mΩ~10Ω			39mΩ~49mΩ			50mΩ~99mΩ			100mΩ~10Ω		
	100			50			150			100			50		
Operating Temp. Range	-55 °C~+155 °C														

Case Size*	1206				1210			2010		2512			
Power Rating	1/4W	1/2W	1/4W	1/2W	1W	1/4W	1/2W	1W	3/4W	1.5W	1W	2W	3W
Resistance Range (Ω)	10m~38m		39m~10						100m~10				
Resistance Tolerance %	±1.0%, ±2.0%, ±5.0%		±0.25%**, ±0.5%, ±1.0%, ±2.0%, ±5.0%										
TCR ±ppm/°C	10mΩ~38mΩ		39mΩ~49mΩ		50mΩ~99mΩ		100mΩ~10Ω		100mΩ~10Ω				
	200		150		100		50		50				
Operating Temp. Range	-55 °C~+155 °C												

*Case size color reflected in chart **0.25 Tolerance limited to 470mΩ~10Ω and 50 TCR

Max Current Rating vs Resistance



KU_A Long Side

Low Ohm Thin Film Resistor

Construction

- High purity alumina ceramic
- Metal plate resistive element
- Epoxy-resin overcoat
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfur

Features

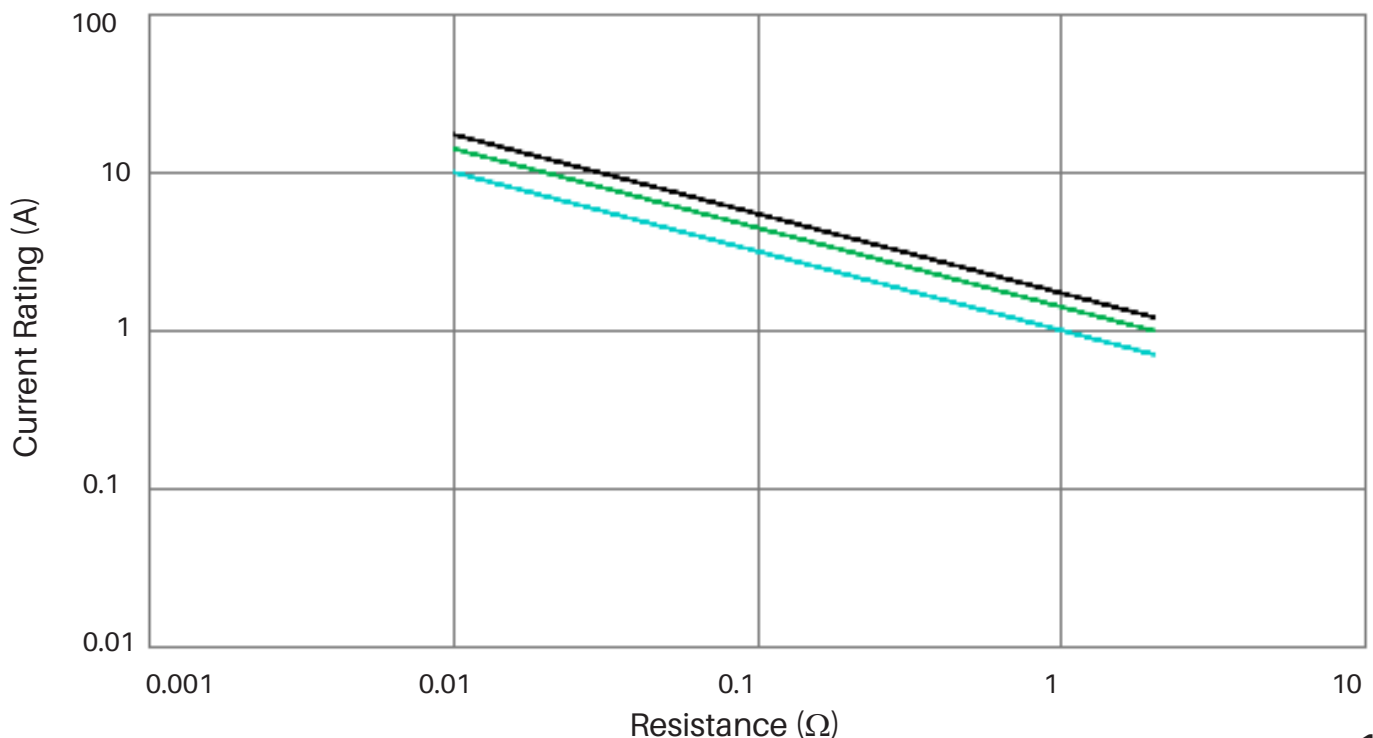
- 0508, 0612, 1020, 1225 English case size
- Power up to 3W
- Resistances from 10mΩ~2Ω
- TCR down to ±100ppm/°C
- Tolerance down to ±0.5%
- AEC-Q200 qualified
- Moisture sensitivity level (MSL) = 1



Electrical Specifications									
Case Size*		0508		0612		1020		1225	
Power Rating		1W		1W		2W		3W	
Resistance Range (Ω)	±0.5%	100m~2	-	100m~2	-	100m~2	-	100m~2	-
	±1.0%								
	±2.0%	20m~2	10m~19m	20m~2	10m~19m	20m~2	10m~19m	20m~2	10m~19m
	±5.0%								
TCR ±ppm/°C		100	150	100	150	100	150	100	150
Operating Temp. Range		-55 °C~+155 °C							

*Case size color reflected in chart

Max Current Rating vs Resistance



KGAS Short Side

Thick Film Resistor

Construction

- High purity alumina ceramic
- Thick film resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free

Features

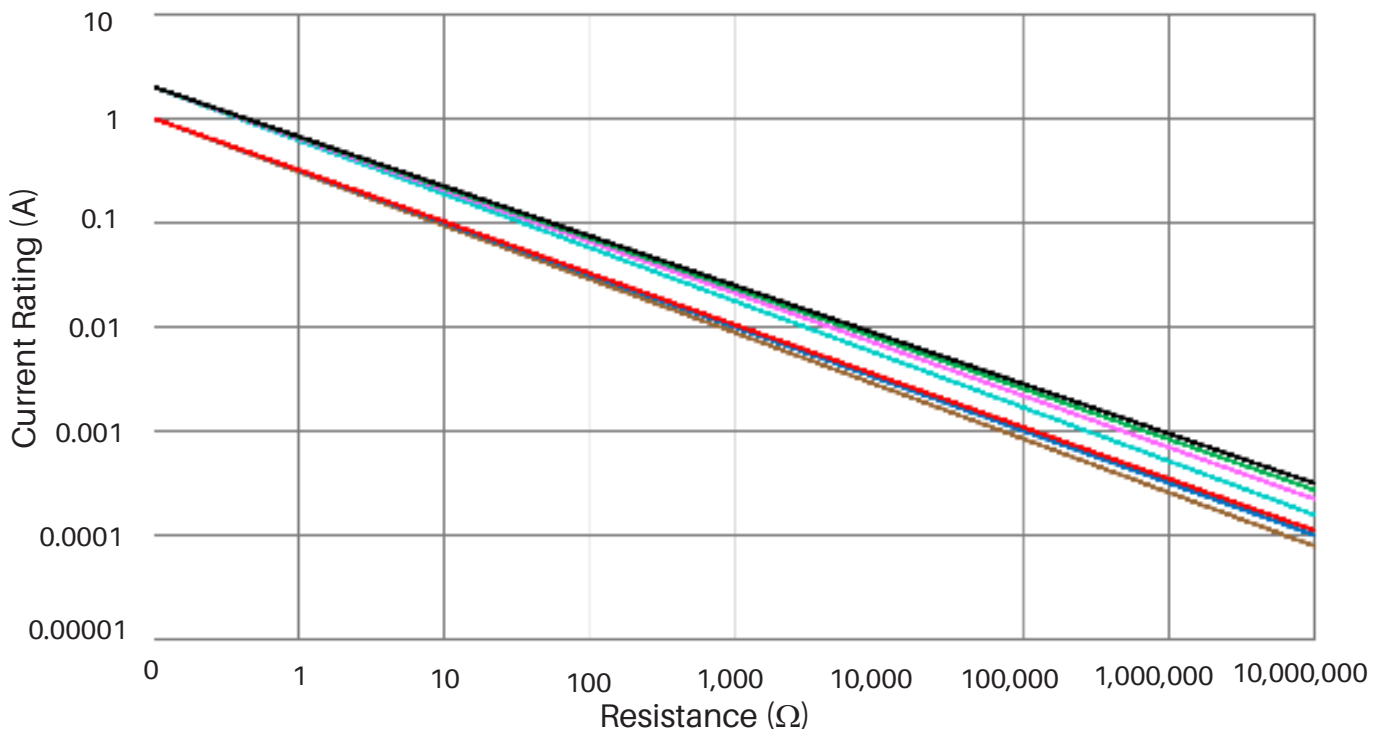
- 0402, 0603, 0805, 1206, 1210, 1812, 2010, 2512 English case size
- Power up to 1W
- Resistances from 1Ω~10MΩ + Jumpers available
- TCR down to ±100ppm/°C
- Tolerance of ±0.5%
- AEC-Q200 Qualified
- Moisture sensitivity Level (MSL) = 1



Electrical Specifications																		
Case Size*	0402	0603	0805	1206	1210	1812	2010	2512										
Power Rating	1/16W	1/10W	1/8W	1/4W	1/2W	3/4W	3/4W	1W										
Rated Jumper Current	1A						2A											
Resistance Range (Ω)	±0.5%	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	
	±1.0%	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	
	±5.0%	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	
TCR ±ppm/°C	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	
Operating Temp. Range	-55°C~+155°C																	

*Case size color reflected in chart

Max Current Rating vs Resistance



KGAS Long side

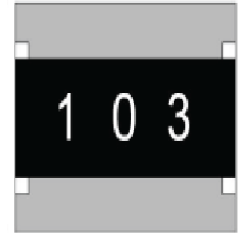
Thick Film Resistor

Construction

- High purity alumina ceramic
- Thick film resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free

Features

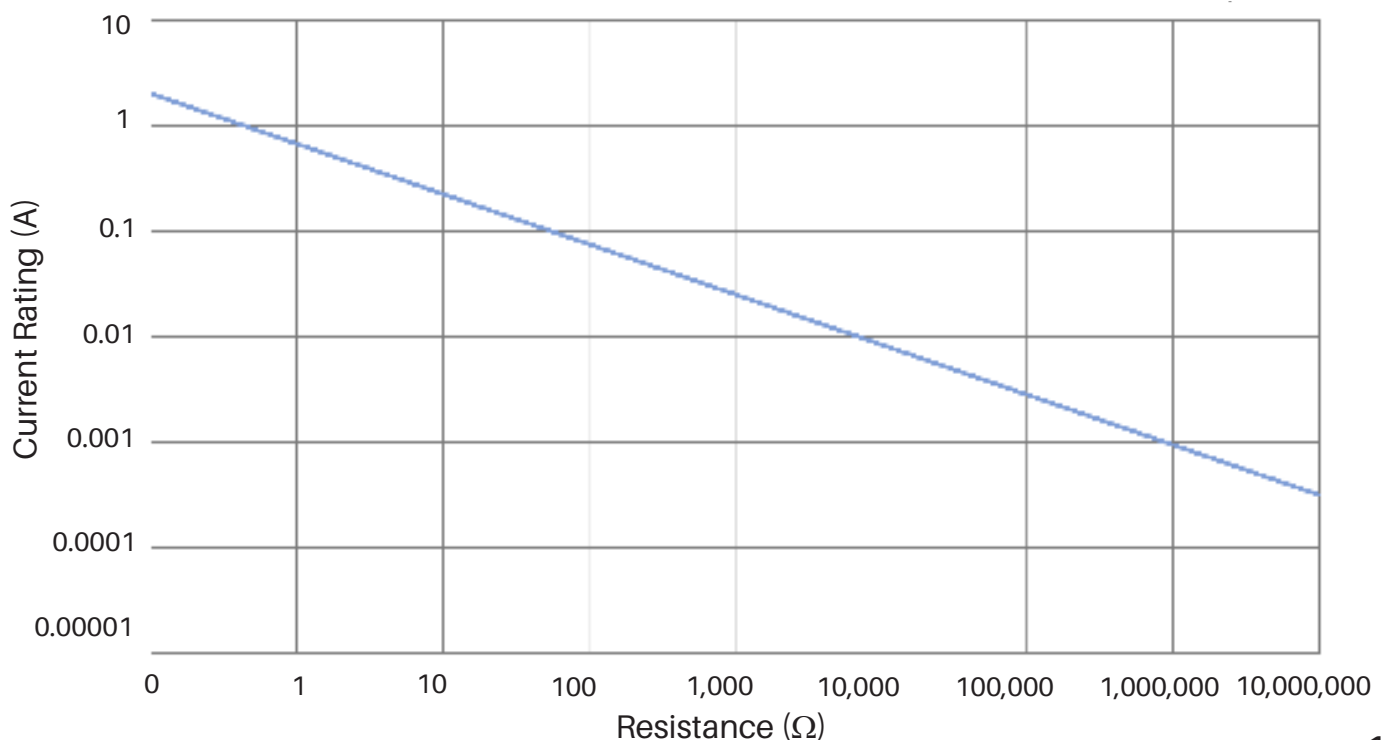
- 1218 English case size
- Power up to 1W
- Resistances from 1Ω~10MΩ + Jumpers available
- TCR down to ±100ppm/°C
- Tolerance of ±0.5%
- AEC-Q200 Qualified
- Moisture sensitivity Level (MSL) = 1



Electrical Specifications			
Case Size*		1218	
Power Rating		1W	
Related Jumper Current		2A	
Resistance Range (Ω)	±0.5%	-	10~1M
	±1.0%	1~9.9	10~10M
	±5.0%		
TCR ±ppm/°C		400	100
Operating Temp. Range		-55 °C~+155 °C	

*Case size color reflected in chart

Max Current Rating vs Resistance



KHA

Thick Film Resistor

Construction

- High purity alumina ceramic
- Thick film resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb Free

Features

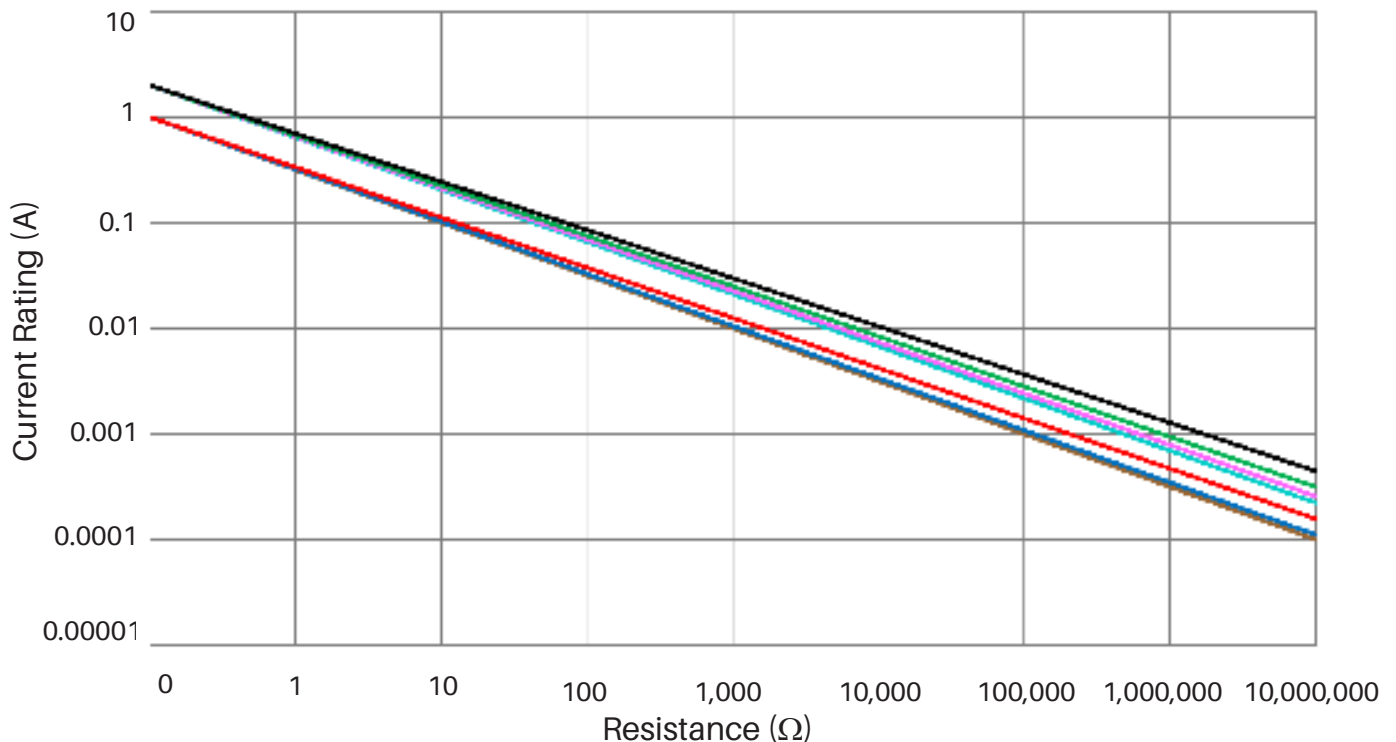
- 0402, 0603, 0805, 1206, 1210, 1812, 2010, 2512 English case sizes
- Power up to 2W
- Resistance range of 1Ω ~ $10M\Omega$ + Jumper available
- TCR's down to $\pm 100\text{ppm}/^\circ\text{C}$
- Tolerance down to $\pm 1.0\%$
- AEC-Q200 qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications																		
Case Size*	0402	0603	0805	1206	1210	1812	2010	2512										
Power Rating	1/10W	1/8W	1/4W	1/2W	2/3W	1W	1W	2W										
Rated Jumper Current	1A						2A											
Resistance Range (Ω)	$\pm 1.0\%$	1-9	10-10M	1-9	10-10M	1-9	10-10M	1-9	10-10M	1-9	10-10M	1-9	10-10M	1-9	10-10M	1-9	10-10M	
	$\pm 5.0\%$																	
TCR $\pm\text{ppm}/^\circ\text{C}$	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	
Operating Temp. Range	-55 $^\circ\text{C}$ ~+155 $^\circ\text{C}$																	

*Case size color reflected in chart

Max Current Rating vs Resistance



KHAP

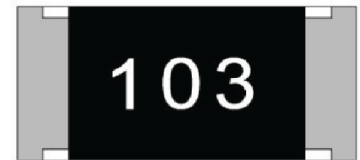
Thick Film Resistor

Construction

- High purity alumina ceramic
- Thick film resistive element
- Halogen Free
- RoHS compliant and Pb free
- Inherently Anti-Sulfer

Features

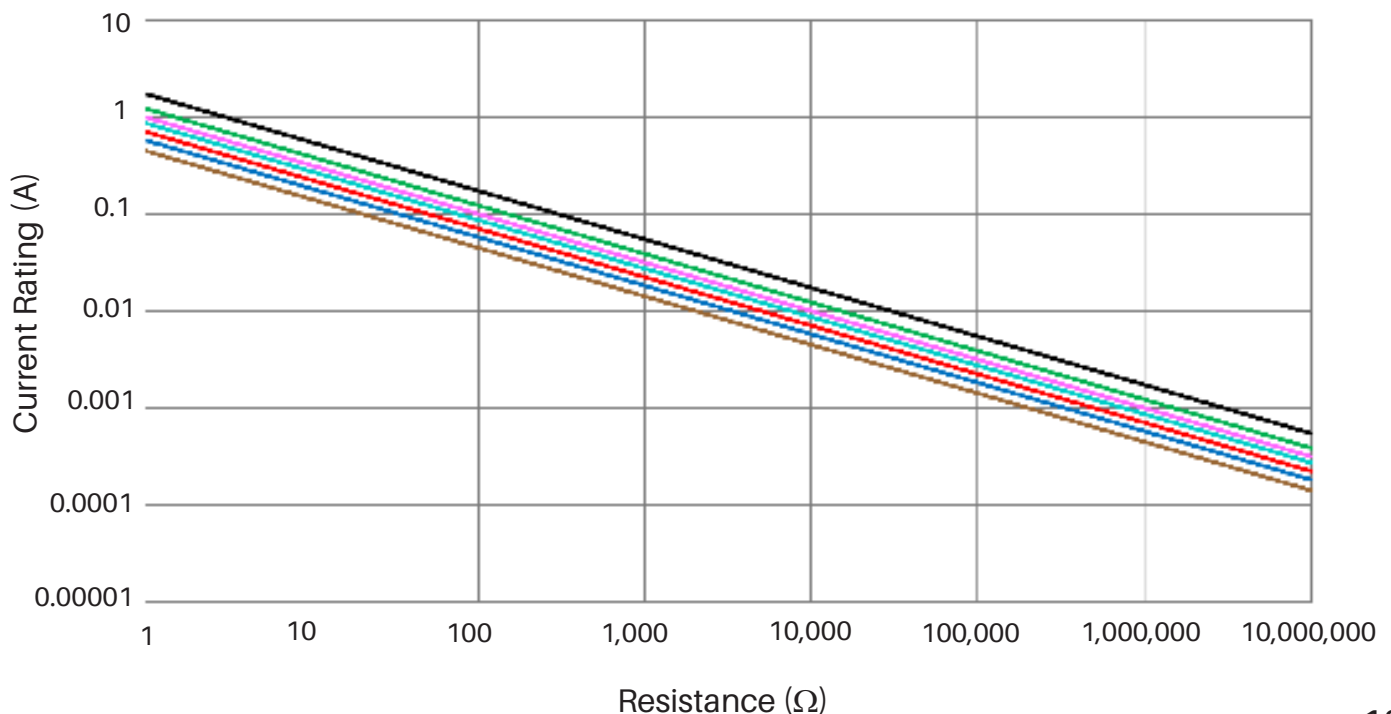
- 0402, 0603, 0805, 1206, 1210, 2010, 2512 English case size
- Power up to 3W
- Resistances from 1Ω~10MΩ
- TCR down to ±100ppm/°C
- Tolerance down to 0.5%
- AEC-Q200 qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications															
Case Size*		0402		0603		0805		1206		1210		2010		2512	
Power Rating		1/5W		1/3W		1/2W		3/4W		1W		1.5W		2W	
Resistance Range (Ω)	±0.5%	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	1~1M	-	10~1M	-	10~1M
	±1.0%														
	±2.0%	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	1~10M	1~<10	10~10M	1~<10	10~10M
	±5.0%														
TCR ±ppm/°C		400	100	400	100	400	100	400	100	400	100	400	150	400	150
Operating Temp. Range		-55°C~+155°C													

*Case size color reflected in chart

Max Current Rating vs Resistance



TFA

Thick Film Resistor

Construction

- High purity alumina ceramic
- Thick film resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free

Features

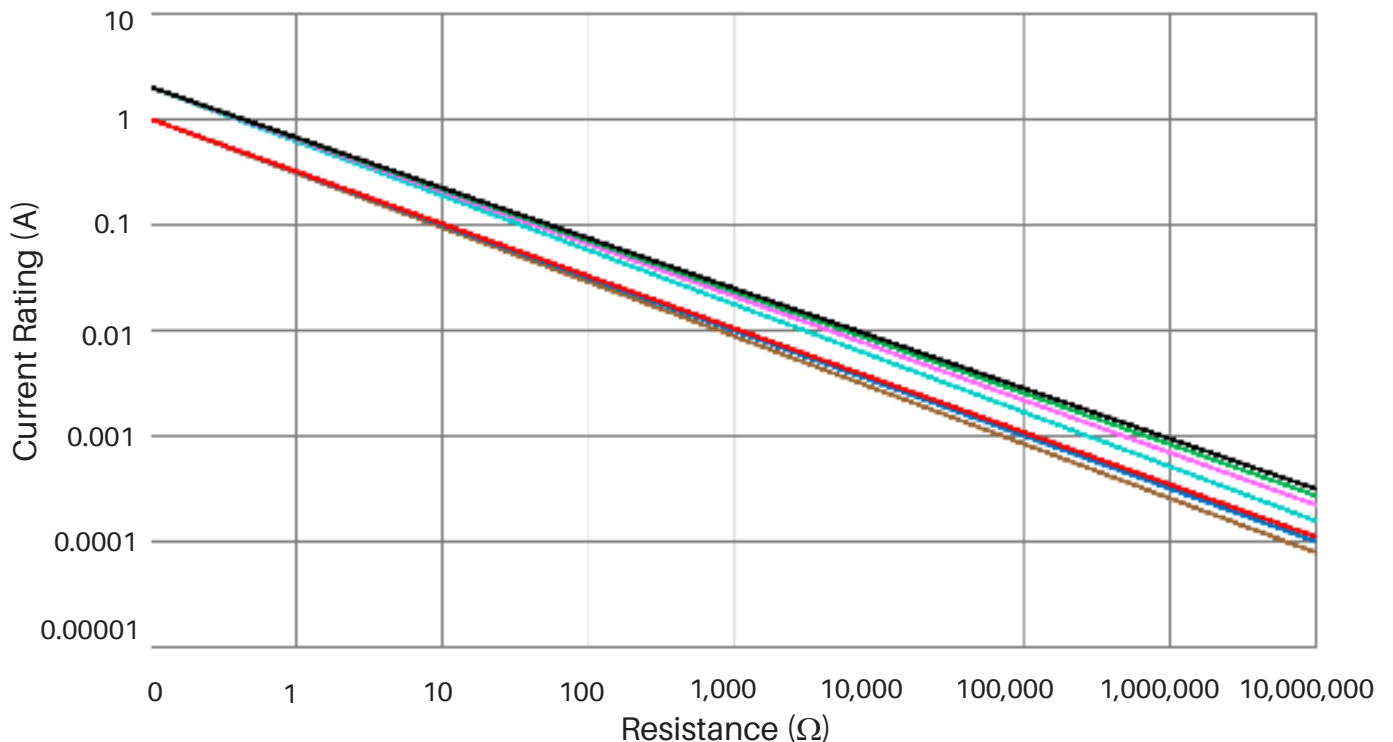
- 0402, 0603, 0805, 1206, 1210, 1812, 2010, 2512 English case sizes
- Resistances from 1Ω ~ $10M\Omega$ + Jumper available
- TCR's down to $\pm 100\text{ppm}/^\circ\text{C}$
- Tolerances down to $\pm 0.1\%$
- AEC-Q200 Qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications																	
Case Size*	0402	0603	0805	1206	1210	1812	2010	2512									
Power Rating	1/16W	1/10W	1/8W	1/4W	1/2W	3/4W	3/4W	1W									
Rated Jumper Current	1A								2A								
Resistance Range (Ω)	$\pm 0.1\%$	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M
	$\pm 0.5\%$	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M	-	10~1M
	$\pm 1.0\%$	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M
	$\pm 2.0\%$	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M
	$\pm 5.0\%$	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M	1~<10	10~10M
TCR $\pm\text{ppm}/^\circ\text{C}$	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	100	
Operating Temp. Range	-55 $^\circ\text{C}$ ~+155 $^\circ\text{C}$																

*Case size color reflected in chart

Max Current Rating vs Resistance



TFAW

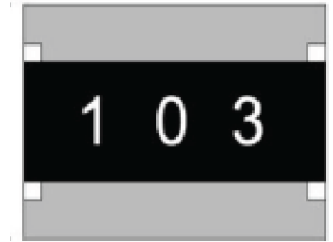
Thick Film Resistor

Construction

- High purity alumina ceramic
- Thick film resistive element
- 100% matte tin over Ni terminations
- Halogen Free
- RoHS compliant and Pb free

Features

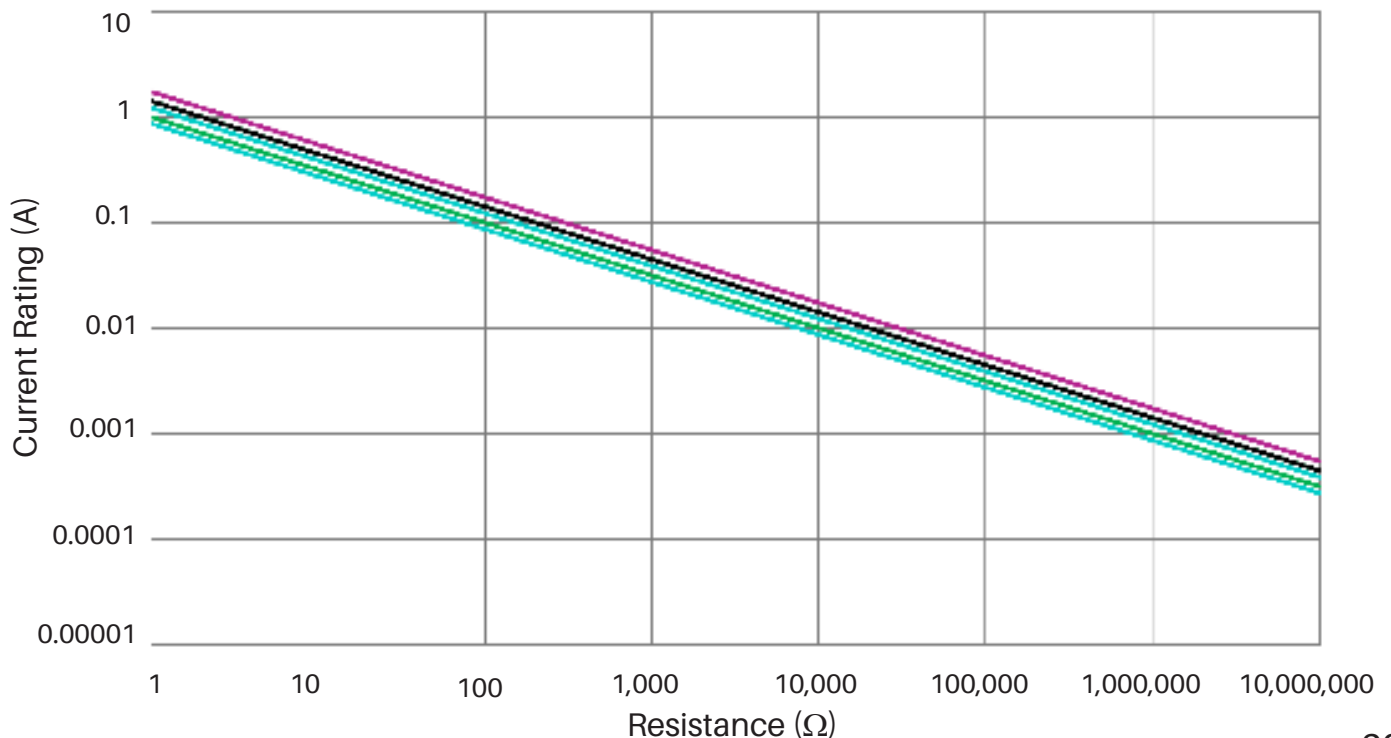
- 0612, 1020, 1218, 1225, 2030 English case sizes
- Resistances from 1Ω ~ $10M\Omega$
- TCR's down to $\pm 100\text{ppm}/^\circ\text{C}$
- Tolerances down to $\pm 1.0\%$
- AEC-Q200 qualified
- Moisture Sensitivity Level (MSL) = 1



Electrical Specifications																			
Case Size*		0612				1020				1218				1225				2030	
Power Rating		3/4W	1.5W	3/4W	1.5W	1W	2W	1W	2W	1W	2W	1W	2W	2W	3W	2W	3W	3W	
Resistance Range (Ω)	$\pm 1.0\%$	1~<10		10~10M		1~<10		10~10M		1~<10		10~10M		1~<10		10~10M		1~<10	10~10M
	$\pm 5.0\%$	1~<10		10~10M		1~<10		10~10M		1~<10		10~10M		1~<10		10~10M		1~<10	10~10M
TCR $\pm\text{ppm}/^\circ\text{C}$		200	100			200	100			200	100			200	100			200	100
Operating Temp. Range		-55 $^\circ\text{C}$ ~+155 $^\circ\text{C}$																	

*Case size color reflected in chart

Max Current Rating vs Resistance



QUALITY COMPONENTS WORLDWIDE

Thin Film Technology delivers quality products and services to customers on an ongoing basis. The implementation and maintenance of ISO certified quality management systems helps us to obtain our mission of "total customer satisfaction" with production and operations worldwide.



THIN FILM TECHNOLOGY HEADQUARTERS

Component Design & Manufacturing
Research and Development
Engineering Services
Quality Assurance Center
Sales Center

01 CUSTOMER SATISFACTION

TFT's mission and quality policy focuses on customer satisfaction. TFT works actively to ensure the quality of our components and focus on meeting customer needs including on-time delivery.

02 ENVIRONMENTAL COMPLIANCE

- RoHS Compliance
- REACH Regulation
- Conflict Mineral Policy

03 LOW OHM INDUSTRY LEADER

TFT is an industry leader in the low ohm & CSR market, servicing some of the world's largest companies in current sensing applications, such as battery management and LED circuits.

INDUSTRY PARTNERS PROVIDING VALUE



JUNEWAY ELECTRONIC TECHNOLOGY
Mass Production
Prototyping
Reliability Testing
Research and Development
Qualification Testing



YOKOHAMA ELECTRONIC DEVICES
Prototyping
Production
Engineering Services
Research and Development



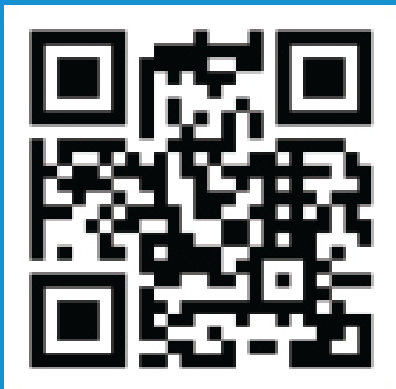
WALTER ELECTRONIC
Sales Center (Fuses)
Mass Production (Fuses)
Prototyping

UNITED STATES
TFT Headquarters
Americas Sales
Europe Sales
Design & Engineering
Quality Center
Logistics Center


CHINA
CSR Components
HF Components
Fuses
Research & Development
Logistics Center

TAIWAN
Asia Sales
Thin Film Components
Thick Film Components
Capacitors
HF Components
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