天二科技股份有限公司

EVER OHMS EVEROHMS TECHNOLOGY CO., LTD.

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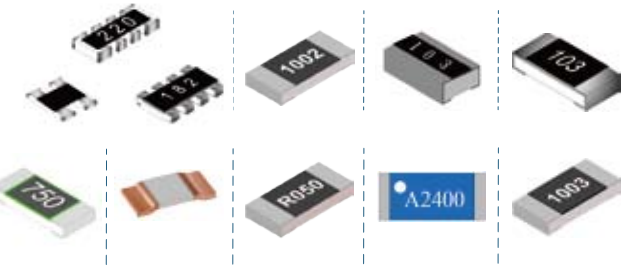
股票代碼：6834



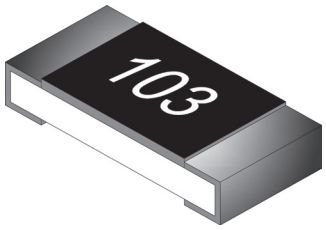
CONTENTS

General Purpose Thick Film Chip Resistor

CR Series

■ Application

— Entertainment: Stereo, TV tuners, Tape recorder
— Appliance: Air conditioner, Refrigerator
— Computer & relative products: Main board, PDA
— Communication equipment: Cell phone, Fax machine
— Power equipment: Power supply, Illumination equipment
— Measuring instrument: Electric meter, Navigation equipment



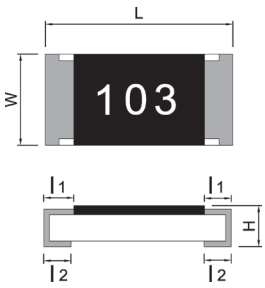
■ Features

— Small size and light weight
— Reduction of assembly costs and matching with placement machines
— Reliability, high quality and fast delivery

■ Parts Number Explanation

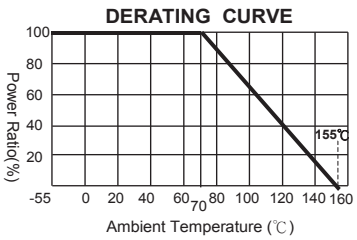
CR	0603	J	10R0	P	05	Z
Product Type	**Size (Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
CR: Thick Film	0201 0402 0603 0805 1206 1210 1812 2010 2512	B：± 0.1% D：± 0.5% F：± 1% G：± 2% J：± 5%	10mR=R010 100mR=R100 1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (0603~1210) Q：Paper Taping (0201、0402) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS 20：20000PCS 40：40000PCS 50：50000PCS	Z：Default code (Resistor Paste). S：TCR ±100ppm. R：Metal Paste.

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2
CR0201	0.60 ± 0.03	0.30 ± 0.03	0.23 ± 0.05	0.15 ± 0.05	0.15 ± 0.05
CR0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
CR0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
CR0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
CR1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
CR1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
CR1812	4.50 ± 0.10	3.10 ± 0.15	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
CR2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
CR2512	6.30 ± 0.20	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20



■ Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
					B(±0.1%) D(±0.5%)	F(±1%) G(±2%)	J(±5%)
CR0201	0.05 W	25V	50V	-200/+400	-	1Ω≦R<10Ω	
				±200	-	10Ω≦R≦10MΩ	
CR0402	0.063 W	50V	100V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CR0603	0.1 W	75V	150V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CR0805	0.125 W	150V	300V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CR1206	0.25 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CR1210	0.5 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CR1812	0.75 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CR2010	0.75 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CR2512	1 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～+155℃
- Type CR0603/0805/1206/1210/1812/2010/2512 1Ω≦R≦10Ω optional code 「S」is Low TCR Alloy Film: ±100 **PPM/℃**

Type	0201	0402	0603	0805	1206	1210	1812	2010	2512
Jumper Resistance Value	50mΩ Max								
Jumper Rated Current	0.5A	1A			2A				
Max. Over Load Current <1 second and 1 times	1A	3A			10A				

Low-Resistance Specifications

Item / Type	Rated Power at 70℃	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (mΩ) F(±1%)、J±(5%)
CR0402	0.063 W	0.12~0.25V	0.624 V	±1000	220≦R≦450
				±800	450<R<1000
CR0603	0.1 W	0.09~0.31V	0.775 V	±1000	75≦R<100
				±800	100≦R≦330
				±600	330<R<1000
CR0805	0.125 W	0.04~0.35V	0.875 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CR1206	0.25 W	0.05~0.5V	1.25 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CR1210	0.5 W	0.07~0.7V	1.75 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CR1812	0.75 W	0.08~0.8V	2.15 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CR2010	0.75 W	0.08~0.8V	2.15 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CR2512	1 W	0.1~0.99V	2.475V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.
- Type CR1206/1210/1812/2010/2512 100 mΩ≦R<1000mΩ optional code 「R」is Metal Paste.
  TCR ±200 **PPM/℃** (100m**Ω**≦R≦200 m**Ω**) , TCR ±100 **PPM/℃** (200m**Ω**＜R<1000 m**Ω**)
- Type CR1206 10 mΩ≦R<100mΩ optional code 「R」is Metal Paste.
  TCR ±1800 PPM/℃ (10mΩ≦R<20 mΩ) , TCR ±1200 PPM/℃ (20mΩ≦R<50 mΩ) , TCR ±300 PPM/℃ (50mΩ≦R<100 mΩ)
- Type CR1210 / 2010 / 2512 10 mΩ≦R<100mΩ optional code 「R」is Metal Paste.
  TCR ±1800 PPM/℃ (10mΩ≦R<20 mΩ) , TCR ±800 PPM/℃ (20mΩ≦R<50 mΩ) , TCR ±200 PPM/℃ (50mΩ≦R<100 mΩ)

High-Resistance Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%)	Resistance Range J(±5%)
CR0402	0.063 W	50V	100V	±200	10.1 MΩ ~ 30 MΩ	10.1 MΩ ~ 30 MΩ
CR0603	0.1 W	75V	150V			
CR0805	0.125 W	150V	300V			
CR1206	0.25 W	200V	400V			
CR1210	0.5 W					
CR2010	0.75 W					
CR2512	1 W					

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Reliability Test and Requirement

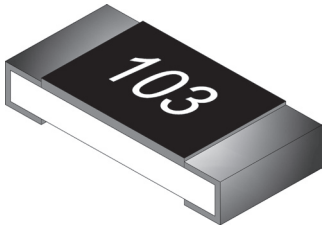
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+155°C, 25°C is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds. Jumper : Over Load Current for 5 seconds 0201=1A , 0402/0603/0805=2.5A 1206/1210/1812/2010/2512=5A	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.10Ω) Jumper : Max 0.05Ω after test.
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C,5 cycles	1% and below： ±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω) Jumper : Max 0.1Ω after test.
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below： ±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω) Value <1Ω：±(3.0%+0.10Ω) Jumper : Max 0.1Ω after test.
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ

High Power Thick Film Chip Resistor

CRH Series

■ Application

- Consumer electrical
- Home Appliance: Air conditioner, Refrigerator
- Computer & relative products: Main board
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply , Illumination equipment
- Measuring instrument: Electric meter, Navigation equipment



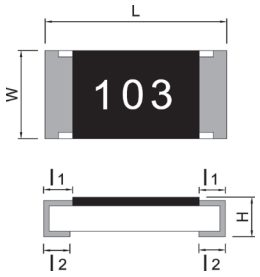
■ Features

- Small size and light weight
- Reliability, high quality

■ Parts Number Explanation

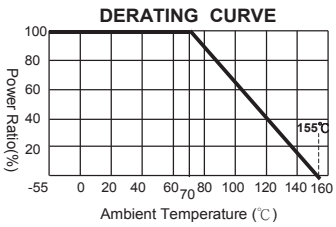
CRH	0603	J	10R0	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
Thick Film High Power Chip Resistor	0402 0603 0805 1206 1210 1812 2010 2512	B : ± 0.1% D : ± 0.5% F : ± 1% G : ± 2% J : ± 5%	0R=0R00 10mR=R010 100mR=R100 1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P : Paper Taping (0603~1210) Q : Paper Taping (0402) E : Embossed Taping	04 : 4000PCS 05 : 5000PCS 10 : 10000PCS 40 : 40000PCS 50 : 50000PCS	Z : Default code S : Low TCR Alloy Film : 100ppm

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2
CRH0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
CRH0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
CRH0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
CRH1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
CRH1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
CRH1812	4.50 ± 0.10	3.10 ± 0.15	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
CRH2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
CRH2512	6.30 ± 0.20	3.20 ± 0.15	0.65 ± 0.10	0.60 ± 0.30	0.60 ± 0.30



■ High Power Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
					B(±0.1%) D(±0.5%)	F(±1%) G(±2%)	J(±5%) K(±10%)
CRH0402	0.1W	50V	100V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CRH0603	0.125W	75V	150V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CRH0805	0.25 W	150V	300V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CRH1206	0.5 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CRH1210	0.66W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CRH1812	1 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CRH2010	1 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CRH2512	2 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : −55℃～+155℃.
- Type CRH0603/0805/1206/1210/1812/2010/2512 1Ω≦R≦10Ω optional code 「S」is Low TCR Alloy Film :100ppm

Type	0402	0603	0805	1206	1210	1812	2010	2512
Jumper Resistance Value	20mΩMax							
Jumper Rated Current	2A	2.5A	3.5A	5A	6A	7A	7A	10A
Max. Over Load Current <1 second and 1 times	6A	9A	13A	16A	19A	22A	22A	30A

High Power Low-Resistance Specifications

Type \ Item	Rated Power at 70℃	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range(mΩ) F(±1%)、J±(5%)
CRH0402	0.1W	0.15 ~ 0.32 V	0.79 V	±1000	220≦R≦450
				±800	450<R<1000
CRH0603	0.125W	0.10 ~ 0.35 V	0.88 V	±1000	75≦R<100
				±800	100≦R≦330
				±600	330<R<1000
CRH0805	0.25W	0.05 ~ 0.50 V	1.25 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRH1206	0.5W	0.07 ~ 0.71 V	1.77 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRH1210	0.66W	0.08 ~ 0.81 V	2.03 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRH1812	1W	0.10 ~ 1.00 V	2.50 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRH2010	1W	0.10 ~ 1.00 V	2.50 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRH2512	2W	0.14 ~ 1.41 V	3.54 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

High Power High-Resistance Specifications

Type \ Item	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%)	Resistance Range J(±5%)
CRH0402	0.1W	50V	100V	±200	10.1 MΩ ~ 30 MΩ	10.1 MΩ ~ 30 MΩ
CRH0603	0.125 W	75V	150V			
CRH0805	0.25 W	150V	300V			
CRH1206	0.5 W	200V	400V			
CRH1210	0.66 W					
CRH2010	1 W					
CRH2512	2 W					

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

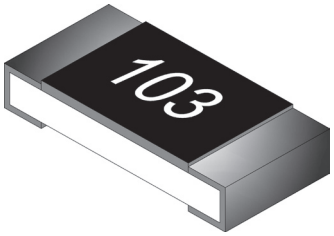
Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	High Power：2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds. Jumper : Over Load Current for 5 seconds 0402=4.5A/0603=6.3A/0805=8.8A1206=11A/ 1210=13A/1812=15A/2010=15A/2512=20A	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.10Ω) Jumper : Max 0.02Ω after test.
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1% and below： ±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω) Jumper : Max 0.05Ω after test.
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	1% and below： ±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω) Value <1Ω：±(3.0%+0.10Ω) Jumper : Max 0.05Ω after test.
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ

Ultra Power Thick Film Chip Resistor

CUH Series

■ Application



- Consumer electrical
- Home Appliance: Air conditioner, Refrigerator
- Computer & relative products: Main board
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply , Illumination equipment
- Measuring instrument: Electric meter, Navigation equipment

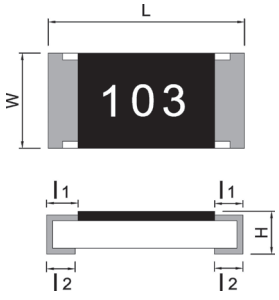
■ Features

- Small size and light weight
- Reliability, high quality

■ Parts Number Explanation

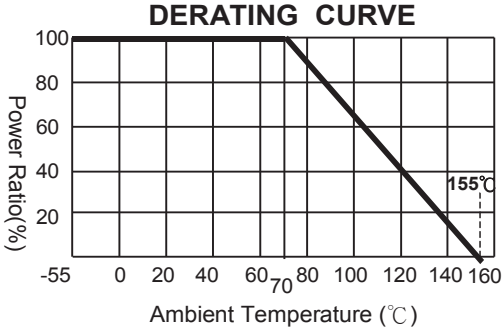
CUH	0603	J	10R0	P	05	Z
Product Type	**Size (Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
Thick Film Ultra High Power Chip Resistor	0402 0603 0805 1206 1210 2010 2512	D : ± 0.5% F : ± 1 % G : ± 2% J : ± 5%	0R=0R00 10mR=R010 100mR=R100 1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P : Paper Taping (0603~1210) Q : Paper Taping (0402) E : Embossed Taping	04 : 4000PCS 05 : 5000PCS 10 : 10000PCS 40 : 40000PCS 50 : 50000PCS	Z : Default code

■ Type Dimension



Unit: mm

TYPE	L	W	H	l_1	l_2
CUH0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
CUH0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
CUH0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
CUH1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
CUH1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
CUH2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
CUH2512	6.30 ± 0.20	3.20 ± 0.15	0.68 ± 0.15	0.60 ± 0.20	0.60 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ Ultra High Power Rating Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
					D(±0.5%)	F(±1%) G(±2%)	J(±5%)
CUH0402	0.2W	50V	100V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CUH0603	0.33W	150V	200V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CUH 0805	0.5W	200V	300V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CUH1206	0.75W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CUH1210	1W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CUH2010	1.5W			±400	-	1Ω≦R<10Ω	
				±150	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
CUH2512	3W	250V	500V	±400	-	1Ω≦R<10Ω	
				±150	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

■ Reliability Test and Requirement

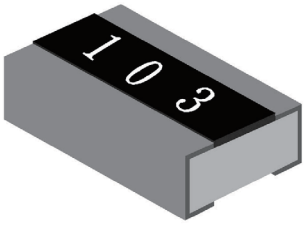
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	Ultra Power : 5 × Rated power or Max Overload Voltage whichever is less for 5 seconds	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.10Ω)
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5℃ for 30 seconds.	Individual leaching area ≦5% Total leaching area ≦ 10%
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	1% and below：±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.05Ω)
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1% and below： ±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs. Then the resistor is left in the room for 48 hrs.	1% and below：±(0.5%+0.05Ω) 2%、5%：±(0.5%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	1% and below： ±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω) Value <1Ω：±(3.0%+0.10Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D： 0402、0603、0805=5mm 1206、1210、1812=3mm 2010、2512=2mm	1% and below：±(1.0%+0.05Ω) 2%、5%：±(1.0%+0.05Ω)

Wide Terminal Thick Film Chip Resistor

CRW Series

■ Application

— Navigation equipment
— Power equipment: Power supply, Illumination equipment
— Indoor lighting, Central door locking



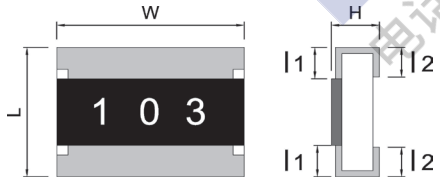
■ Features

— Small size and light weight
— Reliability, high quality
— Chip resistor of the wide terminal type.

■ Parts Number Explanation

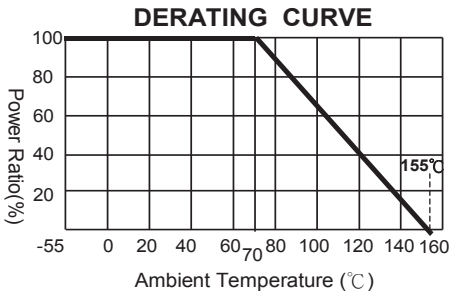
CRW	0612	J	10K0	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
CRW	0612 1020 1218 1225 2030	F：±1% J：±5%	10mR=R010 100mR=R100 1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P:Paper Taping (0612) E:Embossed Taping (1020~2030)	01：1000PCS 04：4000PCS 05：5000PCS	Z:Default

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2
CRW0612	1.60 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.30 ± 0.20	0.50 ± 0.20
CRW1020	2.50 ± 0.20	5.00 ± 0.20	0.55 ± 0.10	0.40 ± 0.20	0.75 ± 0.20
CRW1218	3.10 ± 0.10	4.60 ± 0.10	0.55 ± 0.05	0.40 ± 0.20	0.50 ± 0.20
CRW1225	3.20 ± 0.20	6.50 ± 0.20	0.55 ± 0.20	0.40 ± 0.20	0.75 ± 0.20
CRW2030	5.10 ± 0.10	7.60 ± 0.10	1.06 ± 0.10	0.80 ± 0.20	0.80 ± 0.20



■ Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%)	Resistance Range J(±5%)
CRW0612	0.75 W	200V	400V	±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
CRW1020	1 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
CRW1218	1 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
CRW1225	2W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
CRW2030	3W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃

■ Low-Resistance Specifications

Item / Type	Rated Power at 70℃	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (mΩ) F(±1%)、J±(5%)
CRW0612	0.75W	0.086~0.86V	2.154V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRW1020	1W	0.10~0.99V	2.475V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRW1218	1W	0.10~0.99V	2.475V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
CRW1225	2W	0.141~1.41V	3.518 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃

■ Jumper Electrical Specifications

Type	0612	1020	1218	1225	2030
Jumper Resistance Value	20mΩMax				
Jumper Rated Current	4A	6A	6A	8A	10A
Max. Over Load Current <1 second and 1 times	15A	22A	22A	30A	35A

■ Reliability Test and Requirement

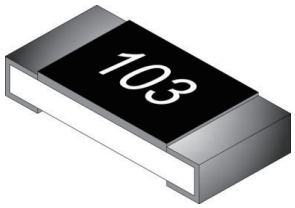
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds. Jumper : Over Load Current for 5 seconds 0612=10A / 1020=15A / 1218=15A 1225=20A / 2030=25A	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.10Ω) Jumper : Max 0.02Ω after test.
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1% and below： ±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω) Jumper : Max 0.05Ω after test.
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	1% and below： ±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω) Value <1Ω：±(3.0%+0.10Ω) Jumper : Max 0.05Ω after test.
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ

Anti-Sulfur Thick Film Chip Resistor

ST Series

■ Application

— Industrial Control, System Sensor, Netcom Station
— Navigation Equipment
— Measuring Instrument
— Telecommunication Equipment, Railway Semaphore System



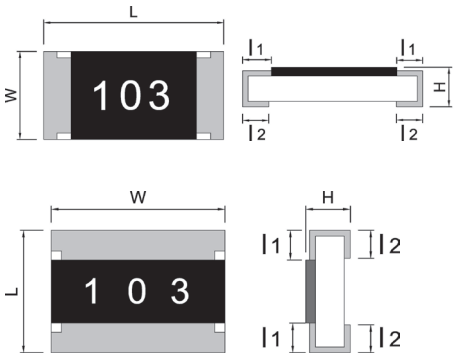
■ Features

— Small Size and Light Weight
— Reliability, High Quality
— Excellent Resistance to Vulcanization (ASTM-B-809-95 & EIA-977 Specification)

■ Parts Number Explanation

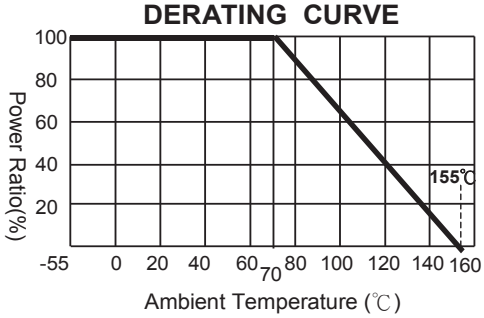
ST	0603	J	100R	P	05	Z
Product Type	**Size (Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
ST: Anti-Sulfur	0402 0603 0805 1206 1210 1812 2010 2512	D : ± 0.5% F : ± 1% J : ± 5%	EX : 0R=0R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P : Paper Taping (0603~1210) Q : Paper Taping (0402) E : Embossed Taping	04 : 4000PCS 05 : 5000PCS 10 : 10000PCS 20 : 20000PCS 40 : 40000PCS 50 : 50000PCS	Z : 60℃ A : 105℃ (With AEC-Q200 compatible)

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2
ST0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
ST0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
ST0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
ST1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
ST1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
ST1812	4.50 ± 0.10	3.10 ± 0.15	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
ST2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
ST2512	6.30 ± 0.20	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ Standard Electrical Specification

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
	Standard				D(±0.5%)	F(±1%)	J(±5%)
ST0402	0.063 W	50V	100V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
ST0603	0.1 W	75V	150V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
ST0805	0.125 W	150V	300V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
ST1206	0.25 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
ST1210	0.5 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
ST1812	0.75 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
ST2010	0.75 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
ST2512	1 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range：−55℃～＋155℃.

Type	0402	0603	0805	1206	1210	1812	2010	2512
Jumper Resistance Value	50mΩ Max							
Jumper Rated Current	1A			2A				
Max.Over Load Current ＜1 second and 1 times	3A			10A				

■ Reliability Test and Requirement

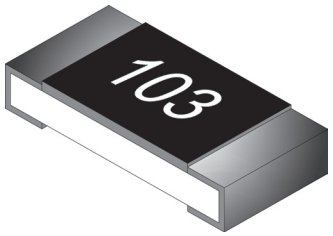
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds. Jumper: Over Load Current for 5 seconds 0402/0603/0805=2.5A 1206/1210/1812/2010/2512=5A	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.10Ω) Jumper : Max 0.05Ω after test
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	1% and below：±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.05Ω)
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1% and below： ±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω) Jumper : Max 0.1Ω after test
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below： ±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω) Value <1Ω：±(3.0%+0.10Ω) Jumper : Max 0.1Ω after test
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ
Sulfur Test	ASTM-B-809-95 EIA-977	60±2℃, no rating power for 1000 hrs	ΔR：±(1.0%+0.05 Ω)
		105±2℃, no rating power for 1000 hrs	ΔR：±(2.0%+0.05 Ω)

Anti-Sulfur High Power Thick Film Chip Resistor

STH Series

■ Application

— Industrial Control, System Sensor, Netcom Station
— Navigation Equipment
— Measuring Instrument
— Telecommunication Equipment, Railway Semaphore System



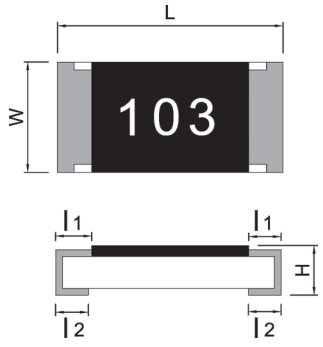
■ Features

— Small Size and Light Weight
— Reliability, High Quality
— Excellent Resistance to Vulcanization (ASTM-B-809-95 & EIA-977 Specification)

■ Parts Number Explanation

STH	0603	J	100R	P	05	Z
Product Type	**Size (Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
STH	0402 0603 0805 1206 1210 1812 2010 2512	D : ± 0.5% F : ± 1% J : ± 5%	EX : 0R=0R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P : Paper Taping (0603~1210) Q : Paper Taping (0402) E : Embossed Taping	04 : 4000PCS 05 : 5000PCS 10 : 10000PCS 20 : 20000PCS 40 : 40000PCS 50 : 50000PCS	Z : 60℃ A : 105℃ (With AEC-Q200 compatible)

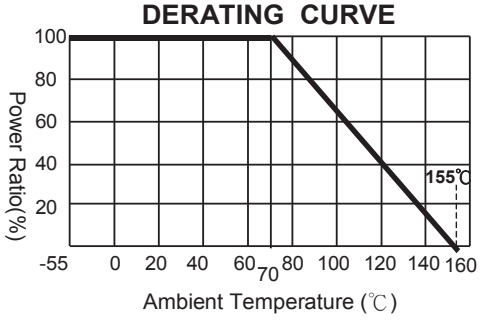
■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2
STH0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
STH0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
STH0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
STH1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
STH1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
STH1812	4.50 ± 0.10	3.10 ± 0.15	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
STH2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
STH2512	6.30 ± 0.20	3.20 ± 0.15	0.65 ± 0.15	0.60 ± 0.30	0.60 ± 0.30

DERATING CURVE



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ High Power Electrical Specification

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
	High				D(±0.5%)	F(±1%)	J(±5%)
STH0402	0.1 W	50V	100V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
STH0603	0.125 W	75V	150V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
STH0805	0.25 W	150V	300V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
STH1206	0.5 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
STH1210	0.66 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
STH1812	1 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
STH2010	1 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
STH2512	2 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range：−55℃～＋155℃.

Type	0402	0603	0805	1206	1210	1812	2010	2512
Jumper Resistance Value	20mΩ Max							
Jumper Rated Current	2A	2.5A	3.5A	5A	6A	7A	7A	10A
Max.Over Load Current ＜1 second and 1 times	6A	9A	13A	16A	19A	22A	22A	30A

■ Reliability Test and Requirement

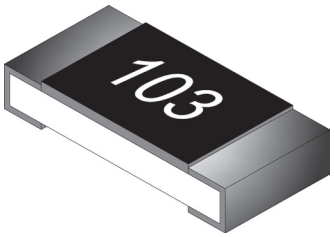
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	High Power：2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds. Jumper: Over Load Current for 5 seconds 0402/0603/0805=2.5A 1206/1210/1812/2010/2512=5A	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.10Ω) Jumper : Max 0.05Ω after test
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1% and below： ±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω) Jumper : Max 0.1Ω after test
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below： ±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω) Value <1Ω：±(3.0%+0.10Ω) Jumper : Max 0.1Ω after test
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ
Sulfur Test	ASTM-B-809-95 EIA-977	60±2℃, no rating power for 1000 hrs	ΔR：±(1.0%+0.05 Ω)
		105±2℃, no rating power for 1000 hrs	ΔR：±(2.0%+0.05 Ω)

High Voltage Thick Film Chip Resistor

HR Series

■ Application

- Power supply, Industrial control system
- Measurement instrument
- Back light inverter
- Medical, Precision equipments



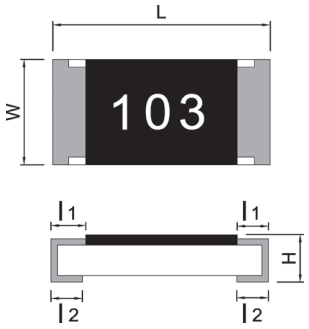
■ Features

- Special material and design for high working voltage require
- Meet IEC62368 standard (0805 100K~27M , 1206 75K~27M , 2512 75K~27M)

■ Parts Number Explanation

HR	2010	F	1M00	E	04	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
HR	0402 0603 0805 1206 1210 2010 2512	D : ±0.5% F : ±1% J : ±5%	100R=100R 1K=1K00 1M=1M00	P : Paper Taping (0603~1210) Q : Paper Taping (0402) E : Embossed Taping	04 : 4000PCS 05 : 5000PCS 10 : 10000PCS 40 : 40000PCS 50 : 50000PCS	Z : Type-1 Normal Type U : Type-2 Super Type

■ Type Dimension

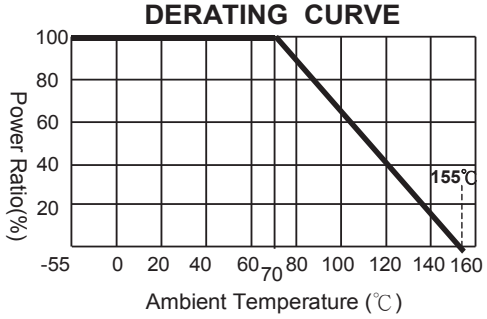


Unit: mm

TYPE-1	L	W	H	I_1	I_2
HR0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
HR0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
HR0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
HR1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
HR1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
HR2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
HR2512	6.30 ± 0.20	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20

Unit: mm

TYPE-2	L	W	H	I_1	I_2
HR1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.30 ± 0.20	0.60 ± 0.20
HR1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.30 ± 0.20	0.60 ± 0.20
HR2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.40 ± 0.20	0.60 ± 0.20
HR2512	6.30 ± 0.20	3.20 ± 0.15	0.55 ± 0.10	0.40 ± 0.20	0.60 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ Standard Electrical Specifications

TYPE-1	Rated Power At 70℃	Max. Working Voltage	Max. Over Load Voltage	T.C.R (ppm/℃)	Resistance Range		
					D: ±0.5%	J : ±5%	F : ±1%
HR0402	0.063W	100V	200V	±100	-	100Ω≦R≦10MΩ	
HR0603	0.1W	350 V	500 V	±100	-	47Ω≦R≦10MΩ	
				±200	-	10MΩ<R≦30MΩ	
HR0805	0.125 W	400 V	800 V	±100	100KΩ≦R≦1MΩ	47Ω≦R≦10MΩ	
				±200	-	10MΩ<R≦30MΩ	
HR1206	0.25 W	500 V	1000 V	±100	100KΩ≦R≦2MΩ	47Ω≦R≦10MΩ	
				±200	-	10MΩ<R≦30MΩ	
HR1210	0.33 W			±100	100KΩ≦R≦1MΩ	47Ω≦R≦10MΩ	
				±200	-	10MΩ<R≦30MΩ	
HR2010	0.5 W			±100	100KΩ≦R≦1MΩ	47Ω≦R≦10MΩ	
				±200	-	10MΩ<R≦30MΩ	
HR2512	1.0 W			±100	43KΩ≦R≦1MΩ	47Ω≦R≦10MΩ	
				±200	-	10MΩ<R≦30MΩ	

TYPE-2	Rated Power At 70℃	Max. Working Voltage (DC)	Max. Over Load Voltage (DC)	T.C.R (ppm/℃)	Resistance Range		
					D: ±0.5%	J : ±5%	F : ±1%
HR1206	0.25	800 V	1000 V	±100	100KΩ≦R≦2MΩ	100KΩ≦R≦10MΩ	
HR1210	0.33	800 V	1000 V	±100	100KΩ≦R≦2MΩ		
HR2010	0.5 W	2000 V	3000 V	±100	100KΩ≦R≦1MΩ		
HR2512	1.0 W	3000 V	4000 V	±100	43KΩ≦R≦1MΩ		

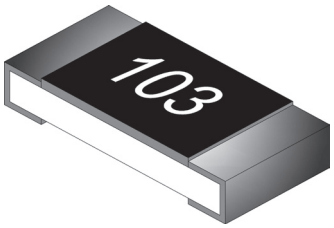
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

■ Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements	
			TYPE-1	TYPE-2
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec	
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	1% and below：±(1.0%+0.05Ω) 5%：±(2.0%+0.1Ω)	±2.0%
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	1% and below：±(0.5%+0.05Ω) 5%：±(1.0%+0.05Ω)	±1.0%
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1% and below：±(0.5%+0.05Ω) 5%： ±(1.0%+0.10Ω)	±1.0%
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 5%：±(2.0%+0.05Ω)	±3.0%
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	1% and below：±(1.0%+0.05Ω) 5%：±(3.0%+0.10Ω)	±3.0%
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ	

Anti-Surge Thick Film Chip Resistor

AS Series



■ Application

- ─ Metering(Testing/Measurement)
- ─ Medical Devices
- ─ Automotive
- ─ Power supply
- ─ Charger
- ─ Inverter
- ─ LCD Video Monitors

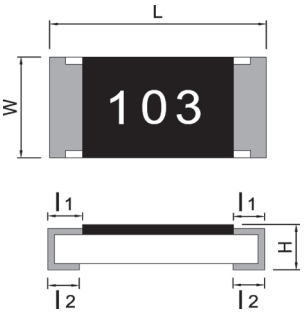
■ Features

- ─ High power rating
- ─ Improved working voltage ratings
- ─ Standard package sizes of 0402~2512
- ─excellent Anti-Pulse ability (Tolerance 1%&2%)
- ─excellent Anti-Surge ability (Tolerance 5%&10%&20%&30%)
- ─AEC-Q200 Compliant

■ Parts Number Explanation

AS	0603	J	10R0	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
AS : Anti-Surge	0402 0603 0805 1206 1210 2010 2512	F : ± 1% G : ± 2% J : ± 5% K : ±10% M : ± 20% N : ±30%	1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P : Paper Taping (0603~1210) Q : Paper Taping (0402) E : Embossed Taping	04 : 4000PCS 05 : 5000PCS 10 : 10000PCS 40 : 40000PCS 50 : 50000PCS	Z :Type -1 Normal Type H : Type -2 High Power

■ Type Dimension



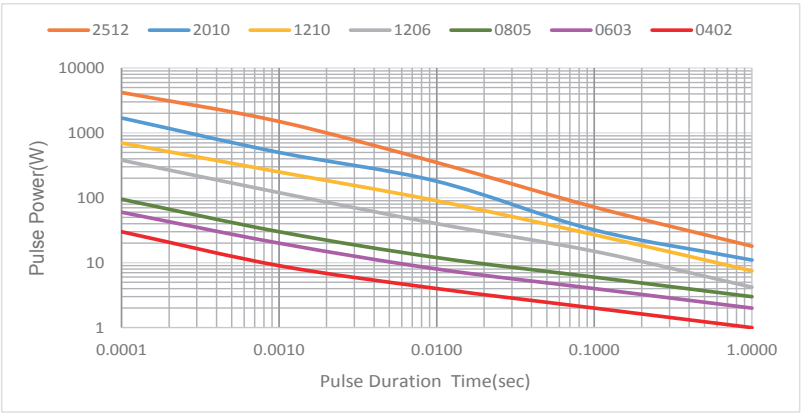
Unit: mm

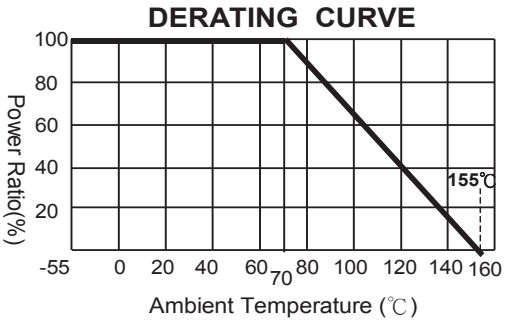
TYPE-1	L	W	H	l_1	l_2
AS0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
AS0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
AS0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
AS1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
AS1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
AS2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
AS2512	6.30 ± 0.20	3.20 ± 0.15	0.68 ± 0.10	0.60 ± 0.20	0.60 ± 0.20

Unit: mm

TYPE-2	L	W	H	l_1	l_2
AS0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
AS0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
AS0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
AS1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
AS1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
AS2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
AS2512	6.30 ± 0.20	3.20 ± 0.15	0.68 ± 0.10	0.60 ± 0.20	0.60 ± 0.20

■ Anti-Surge Ability (Single) :





Standard Electrical Specifications Type-1

Item / Type-1	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
					F(±1%) G(±2%)	J(±5%) K(±10%)	M(±20%) N(±30%)
AS0402	0.1 W	50V	100V	±400	-	1Ω≦R<10Ω	
				±300	-	10Ω≦R<1KΩ	
				±200	10Ω≦R≦1MΩ	1KΩ≦R≦10MΩ	
AS0603	0.125 W	150V	200V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS0805	0.25 W	150V	300V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS1206	0.33 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS1210	0.5 W			±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS2010	0.75 W	400V	800V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS2512	1.5 W	500V	1000V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55°C～+155°C.

High Power Rating Electrical Specifications Type-2

Item / Type-2	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
					F(±1%) G(±2%))	J(±5%) K(±10%	M(±20%) N(±30%)
AS0402	0.125W	50V	100V	±400	-	1Ω≦R<10Ω	
				±300	-	10Ω≦R<1KΩ	
				±200	10Ω≦R≦1MΩ	1KΩ≦R≦10MΩ	
AS0603	0.25 W	150V	200V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS0805	0.4 W	150V	300V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS1206	0.5 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS1210	0.75 W			±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS2010	1 W	400V	800V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-
AS2512	2 W	500V	1000V	±400	-	1Ω≦R<10Ω	
				±200	-	-	10Ω≦R≦10MΩ
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	-

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55°C～+155°C

Reliability Test and Requirement

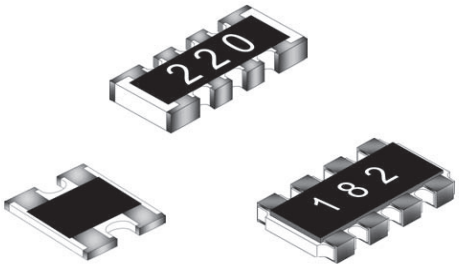
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	Refer to Ratings
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(1.0%+0.05Ω)
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	±(1.0%+0.05Ω)
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	±(1.0%+0.10Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hrs 〝OFF〞.	±(2.0%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hrs 〝OFF〞.	±(3.0%+0.10Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ

Thick Film Chip Resistor Array

CRA Series

■ Application

- Entertainment: Stereo, TV tuners, Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products: Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply, Illumination equipment
- Measuring instrument: Electric meter, Navigation equipment



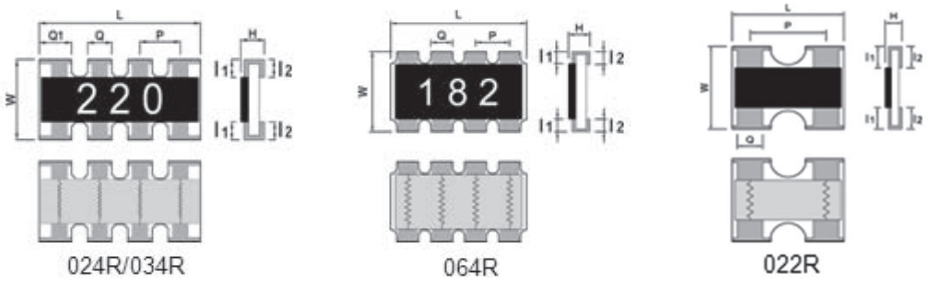
■ Features

- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality and fast delivery

■ Parts Number Explanation

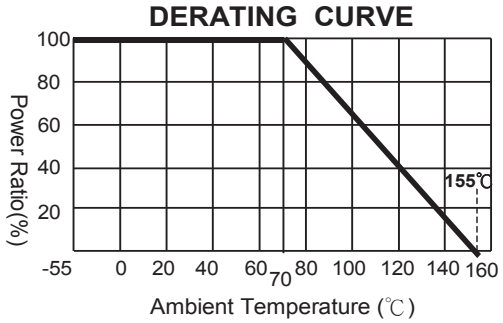
CRA	024R	J	10R0	Q	10	Z
Product Type	**Size (Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
CRA	022R(0402*2) 024R(0402*4) 034R(0603*4) 064R(1206*4) R：CONVEX	F：±1% J：±5%	1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (034R) Q：Paper Taping (022R、024R) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS	Z：Default code

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2	P	Q	Q1
CRA022R	1.00±0.10	1.00±0.10	0.33±0.05	0.15±0.10	0.25±0.10	0.67±0.10	0.34±0.10	---
CRA024R	2.00±0.10	1.00±0.10	0.40±0.10	0.20±0.10	0.20±0.10	0.50±0.10	0.30±0.10	0.43±0.10
CRA034R	3.20±0.20	1.60±0.15	0.50±0.10	0.30±0.20	0.30±0.20	0.80±0.20	0.50±0.15	0.61±0.10
CRA064R	5.10±0.20	3.10±0.20	0.55±0.15	0.55±0.15	0.55±0.15	1.30±0.20	0.90±0.10	---



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure
of derating Curve

■ Standard Electrical Specifications

Item / Type	Rating Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%) J±(5%)	Operating Temperature
CRA022R	0.063 W	25V	50V	±400	1Ω≦R<10Ω	-55℃ ~ +155℃
				±200	10Ω≦R≦1MΩ	
CRA024R	0.063 W	25V	50V	±400	1Ω≦R<10Ω	
				±200	10Ω≦R≦1MΩ	
CRA034R	0.1 W	50V	100V	±400	1Ω≦R<10Ω	
				±200	10Ω≦R≦1MΩ	
CRA064R	0.25 W	200V	400V	±400	1Ω≦R<10Ω	
				±200	10Ω≦R≦1MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Type	022R	024R	034R	064R
Jumper Rated Current	1A			2A

■ Reliability Test and Requirement

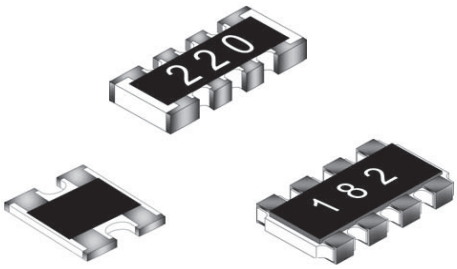
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS C 5201-1 clause 4.8	-55℃ or +155℃, 25℃ is the reference temperature	Refer to Ratings
Short Time Overload	JIS C 5201-1 clause 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	1%：±(1.0%+0.05Ω) 5%：±(2.0%+0.10Ω)
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5℃ for 30 seconds.	Individual leaching area ≦5% Total leaching area ≦ 10%
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.05Ω)
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.10Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs. Then the resistor is left in the room for 48 hrs.	1%：±(0.5%+0.05Ω) 5%：±(0.5%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1%：±(1.0%+0.05Ω) 5%：±(2.0%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1%：±(1.0%+0.05Ω) 5%：±(3.0%+0.10Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ

Anti-Sulfur Thick Film Chip Resistor Array

STA Series

■ Application

— Industrial Control, System Sensor, Netcom Station
— Navigation Equipment
— Measuring Instrument
— Telecommunication Equipment, Railway Semaphore System



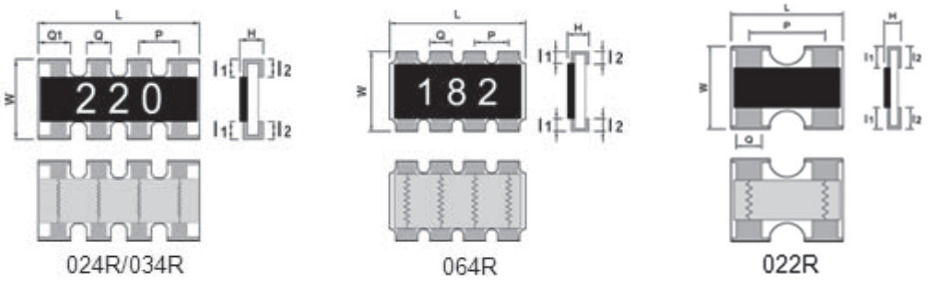
■ Features

— Small Size and Light Weight
— Reliability, High Quality
— Excellent Resistance to Vulcanization (ASTM-B-809-95 Specification)

■ Parts Number Explanation

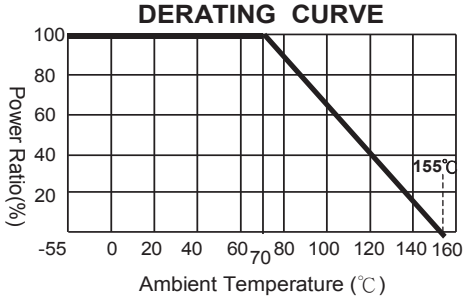
STA	024R	J	100R	Q	05	Z
Product Type	**Size (Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
STA: Anti-Sulfur Array	022R(0402*2) 024R(0402*4) 034R(0603*4) 064R(1206*4) R：CONVEX	F：±1% J：±5%	EX： 0R=0R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (034R) Q：Paper Taping (022R、024R) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS	Z： 60℃ A：105℃ (With AEC-Q200 compatible)

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2	P	Q	Q1
STA022R	1.00±0.10	1.00±0.10	0.33±0.05	0.30±0.15	0.25±0.10	0.67±0.10	0.34±0.10	---
STA024R	2.00±0.10	1.00±0.10	0.40±0.10	0.30±0.15	0.20±0.10	0.50±0.10	0.30±0.10	0.43±0.10
STA034R	3.20±0.20	1.60±0.15	0.50±0.10	0.40±0.20	0.30±0.20	0.80±0.20	0.50±0.15	0.61±0.10
STA064R	5.10±0.20	3.10±0.20	0.55±0.15	0.55±0.20	0.55±0.15	1.30±0.20	0.90±0.10	---



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ Standard Electrical Specifications

Item / Type	Rating Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%)、J±(5%)
STA022R	0.063 W	25V	50V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ
STA024R	0.063 W	25V	50V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ
STA034R	0.1 W	50V	100V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ
STA064R	0.25 W	200V	400V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Type	022R	024R	034R	064R
Jumper Rated Current	1A			2A

■ Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS C 5201-1 clause 4.8	-55℃ or +155℃, 25℃ is the reference temperature	Refer to Ratings
Short Time Overload	JIS C 5201-1 clause 4.13	General：2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds. High Power：2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds.	1%：±(1.0%+0.05Ω) 5%：±(2.0%+0.10Ω)
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5℃ for 30 seconds.	Individual leaching area ≦5% Total leaching area ≦ 10%
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.05Ω)
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.10Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs. Then the resistor is left in the room for 48 hrs.	1%：±(0.5%+0.05Ω) 5%：±(0.5%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1%：±(1.0%+0.05Ω) 5%：±(2.0%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1%：±(1.0%+0.05Ω) 5%：±(3.0%+0.10Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ
Sulfur Test	ASTM-B-809-95 EIA-977	60±2℃, no rating power for 1000 hrs	ΔR：±(1.0%+0.05 Ω)
		105±2℃, no rating power for 1000 hrs	ΔR：±(2.0%+0.05 Ω)

Thin Film Chip Resistor Array

TRA Series

Applications

- Medical equipment
- Measuring instrument
- Communication device
- Precision analogue circuits
- Voltage divider

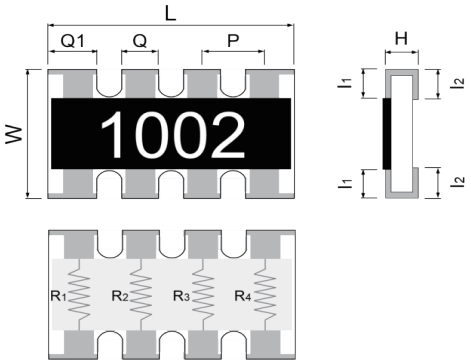
Features

- SMD metal film resistor
- High reliability and stability
- High performance of TCR: 25 ppm/℃
- TCR tracking down to ±5ppm/℃
- Tolerance matching down to ±0.05%

Parts Number Explanation

TRA	034R	B	10K0	P	05	25	Z
Product Type	**Size (Inch)**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm/℃)**	**Optional**
TRA Series Thin Film Chip Resistor Array	034R (0603x4)	B : ±0.1% C : ±0.25% D : ±0.5% F : ±1%	4 digits EX. 22R0 = 22 Ω 100R = 100 Ω 2K20 = 2.2 KΩ 10K0 = 10 KΩ	P : Paper Taping	05 : 5000	25 : ±25 50 : ±50	Z : Default code

Type Dimension



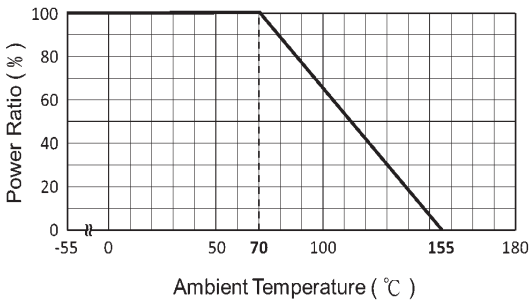
Reference Data

Item	General Specification
Series No.	034R
Size	0603×4
Termination construction	Convex
Array	$R_1 = R_2 = R_3 = R_4$

Unit: mm

TYPE	L	W	H	I_1	I_2	P	Q	Q1
TRA034	3.20±0.20	1.60±0.15	0.50±0.10	0.30±0.20	0.30±0.20	0.80±0.20	0.50±0.15	0.61±0.10

DERATING CURVE



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Item / Type	Rating Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range			
					B ±0.1%	C ±0.25%	D ±0.5%	F ±1%
TRA034R	0.1 W	75 V	150 V	±25 ±50	47 Ω ~ 100 KΩ			

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

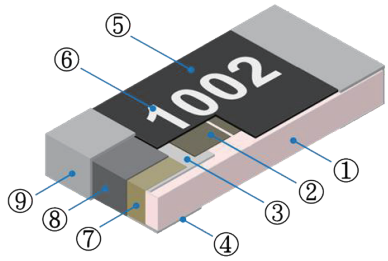
Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+125℃, 25℃ is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(0.5%+0.05Ω) No Visual damage
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Applied 100VDC for 1 minute.	≧10GΩ
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	>95% Coverage No Visual damage
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	±(0.5%+0.05Ω) No Visual damage
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5℃ for 30 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃, 300 cycles	±(0.5%+0.05Ω) No Visual damage
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155±5℃ for 1000 hours.	±(0.5%+0.05Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs. Then the resistor is left in the room for 48 hrs.	±(0.5%+0.05Ω) No Visual damage
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞	±(0.5%+0.05Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.5%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	±(0.5%+0.05Ω)
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D： 3mm	±(0.5%+0.05Ω) No Visual damage

- We can also provide AEC-Q200 test reports if required by customers.

General Purpose Thin Film Chip Resistor

TR Series



①	Alumina Substrate	④	Bottom Inner Electrode	⑦	Side Inner Electrode
②	Resistive Layer	⑤	Protective Overcoat	⑧	Nickel Barrier
③	Top Inner Electrode	⑥	Marking	⑨	Solder coating (Sn)

Applications

— Computer & relative products
— Communication devices
— Measuring instrument
— Converters
— Printing equipment

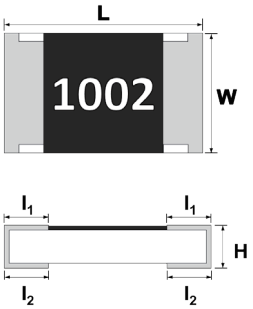
Features

— Tolerance to ±0.1 %
— Low TCR to ±10 ppm/℃
— Down size to 0201
— Halogen free and lead free
— RoHS compliant

Parts Number Explanation

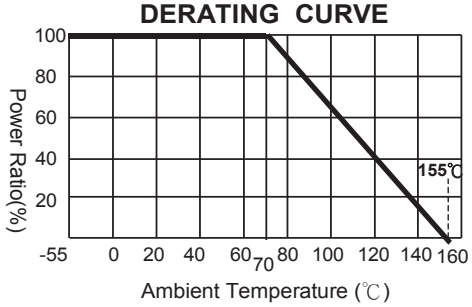
TR	1206	B	10K0	P	05	25	Z
Product Type	**Size (Inch)**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm/℃)**	**Optional**
TR Series Thin Film Chip Resistor	0201 0402 0603 0805 1206 1210 2010 2512	B : ±0.1% C : ±0.25% D : ±0.5% F : ±1%	4 digits EX. 1R00 = 1 Ω 10R0 = 10 Ω 100R = 100 Ω 2K20 = 2.2 KΩ 332K = 332 KΩ 1M00 = 1 MΩ	P : PaperTaping (0603~1206) Q : PaperTaping (0201~0402) E : Embossed Taping	04 : 4000 05 : 5000 10 : 10000 20 : 20000 40 : 40000 50 : 50000	10 : ±10 15 : ±15 25 : ±25 50 : ±50	Z : Default code

Type Dimension



Unit : mm

TYPE	L	W	H	I_1	I_2
TR0201	0.60 ± 0.05	0.30 ± 0.05	0.23 ± 0.05	0.12 ± 0.05	0.15 ± 0.05
TR0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
TR0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TR0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
TR1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TR1210	3.10 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TR2010	5.00 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
TR2512	6.30 ± 0.15	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range B ±0.1%	C ±0.25%	D ±0.5%	F ±1%
TR0201	0.05W	25V	50V	±10	10 Ω ~ 5.1 KΩ			
				±15				
				±25	10 Ω ~ 82 KΩ			
				±50				
TR0402	0.063W	50V	100V	±10	10 Ω ~ 68 KΩ			
				±15				
				±25	4.7 Ω ~ 220 KΩ		2.49 Ω ~ 220 KΩ	
				±50				
TR0603	0.1W	75V	150V	±10	10 Ω ~ 332 KΩ			
				±15				
				±25	4.7 Ω ~ 680 KΩ		2.49 Ω ~ 680 KΩ	
				±50				
TR0805	0.125W	150V	300V	±10	10 Ω ~ 680 KΩ			
				±15				
				±25	4.7 Ω ~ 1 MΩ		2.49 Ω ~ 1 MΩ	
				±50				
TR1206	0.25W	200V	400V	±10	10 Ω ~ 1 MΩ			
				±15				
				±25	4.7 Ω ~ 1.5 MΩ		2.49 Ω ~ 1.5 MΩ	
				±50				
TR1210	0.25W			±10	10 Ω ~ 1 MΩ			
				±15				
				±25	4.7 Ω ~ 1 MΩ		2.49 Ω ~ 1 MΩ	
				±50				
TR2010	0.5W			±10	10 Ω ~ 1 MΩ			
				±15				
				±25	4.7 Ω ~ 1 MΩ		2.49 Ω ~ 1 MΩ	
				±50				
TR2512	0.75W			±10	10 Ω ~ 1 MΩ			
				±15				
				±25	4.7 Ω ~ 1 MΩ		2.49 Ω ~ 1 MΩ	
				±50				

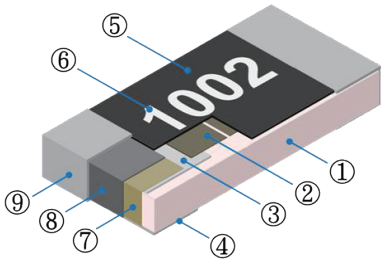
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+125°C, 25°C is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(0.5%+0.05Ω) No Visual damage
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155℃, 300 cycles	±(0.5%+0.05Ω) No Visual damage
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155±5°C for 1000 hours.	±(0.5%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞	±(0.5%+0.05Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.5%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	±(0.5%+0.05Ω)

High Power Thin Film Chip Resistor

TH Series



①	Alumina Substrate	④	Bottom Inner Electrode	⑦	Side Inner Electrode
②	Resistive Layer	⑤	Protective Overcoat	⑧	Nickel Barrier
③	Top Inner Electrode	⑥	Marking	⑨	Solder coating (Sn)

Applications

— Computer & relative products
— Communication devices
— Measuring instrument
— Converters
— Industrial equipment

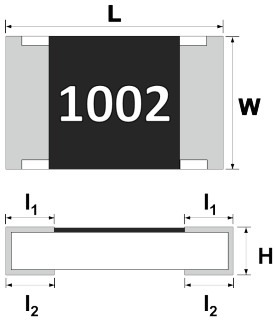
Features

— Tolerance to ±0.1 %
— Low TCR to ±10 ppm/℃
— Excellent long-term stability
— High rated power capability
— Halogen free and lead free
— RoHS compliant

Parts Number Explanation

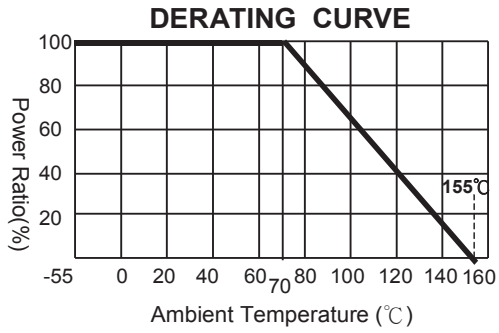
TH	1206	F	10K0	P	05	25	Z
Product Type	**Size (Inch)**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm/℃)**	**Optional**
TH Series High Power Thin Film Chip Resistor	0402 0603 0805 1206 1210 2010 2512	B : ±0.1% C : ±0.25% D : ±0.5% F : ±1% J : ±5%	4 digits EX. 1R00 = 1 Ω 10R0 = 10 Ω 100R = 100 Ω 2K20 = 2.2 KΩ 100K = 100 KΩ	P : PaperTaping (0603~1206) Q : PaperTaping (0402) E : Embossed Taping	04 : 4000 05 : 5000 10 : 10000 20 : 20000 40 : 40000 50 : 50000	10 : ±10 15 : ±15 25 : ±25 50 : ±50 A0 : ±100	Z : Default code

Type Dimension



Unit : mm

TYPE	L	W	H	l_1	l_2
TH0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
TH0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TH0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
TH1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TH1210	3.10 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TH2010	5.00 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
TH2512	6.30 ± 0.15	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20



Power rating is in the case based on continuous full-load at ambient temperature of 70℃. For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (Ω)				
					B (±0.1%)	C (±0.25%)	D (±0.5%)	F (±1%)	J (±5%)
TH0402	1/10W	50V	100V	±10, ±15	10 ~ 10 K				-
				±25	4.7 ~ 10 K		2.49 ~ 10 K		
				±50	4.7 ~ 10 K		1.0 ~ 10 K		
				±100	-			1.0 ~ 10 K	
TH0603	1/8W	150V	300V	±10, ±15	10 ~ 47 K				-
				±25	4.7 ~ 47 K		2.49 ~ 47 K		
				±50	4.7 ~ 47 K		1.0 ~ 47 K		
				±100	-			1.0 ~ 47 K	
TH0805	1/4W	200V	400V	±10, ±15	10 ~ 100 K				-
				±25	4.7 ~ 100 K		2.49 ~ 100 K		
				±50	4.7 ~ 100 K		1.0 ~ 100 K		
				±100	-			1.0 ~ 100 K	
TH1206	1/2W			±10, ±15	10 ~ 100 K				-
				±25	4.7 ~ 100 K		2.49 ~ 100 K		
				±50	4.7 ~ 100 K		1.0 ~ 100 K		
				±100	-			1.0 ~ 100 K	
TH1210	1/2W			±10, ±15	10 ~ 100 K				-
				±25	4.7 ~ 100 K		2.49 ~ 100 K		
				±50	4.7 ~ 100 K		1.0 ~ 100 K		
				±100	-			1.0 ~ 100 K	
TH2010	3/4W			±10, ±15	10 ~ 100 K				-
				±25	4.7 ~ 100 K		2.49 ~ 100 K		
				±50	4.7 ~ 100 K		1.0 ~ 100 K		
				±100	-			1.0 ~ 100 K	
TH2512	1W			±10, ±15	10 ~ 100 K				-
				±25	4.7 ~ 100 K		2.49 ~ 100 K		
				±50	4.7 ~ 100 K		1.0 ~ 100 K		
				±100	-			1.0 ~ 100 K	

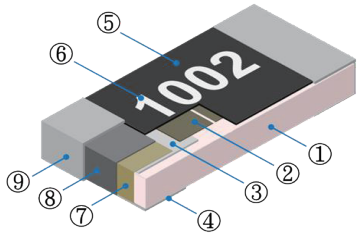
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+125°C, 25°C is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(0.5%+0.05Ω) No Visual damage
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	±(0.5%+0.05Ω) No Visual damage
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155±5°C for 1000 hours.	±(0.5%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞	±(0.5%+0.05Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.5%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	±(0.5%+0.05Ω)
Sulfur Test (FoS)	ASTM B809-95 ANSI/EIA-977	105±2°C, no power rating for 750 hrs.	±(2.0%+0.001Ω)

Precision Product Thin Film Chip Resistor

TP Series



①	Alumina Substrate	④	Bottom Inner Electrode	⑦	Side Inner Electrode
②	Resistive Layer	⑤	Protective Overcoat	⑧	Nickel Barrier
③	Top Inner Electrode	⑥	Marking	⑨	Solder coating (Sn)

Applications

— Computer & relative products
— Communication devices
— Measuring instrument
— Converters
— Printing equipment

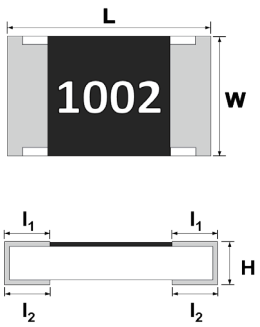
Features

— Excellent long-term stability
— The variance of reliability test is reduced to ±0.1%
— Low TCR down to ±5 ppm/℃
— Tight tolerance down to ±0.01 %
— Halogen free and lead free
— RoHS compliant

Parts Number Explanation

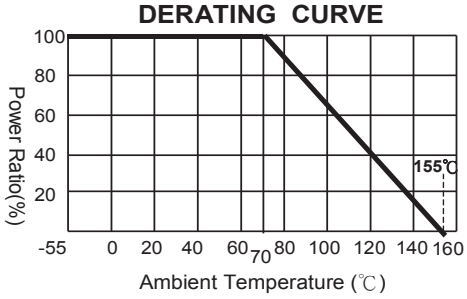
TP	1206	B	10K0	P	05	10	Z
Product Type	**Size (Inch)**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm/℃)**	**Optional**
TP Series Thin Film Precision Chip Resistor	0402 0603 0805 1206 1210 2010 2512	T : ±0.01% A : ±0.05% B : ±0.1% C : ±0.25% D : ±0.5% F : ±1.0%	4 digits EX. 22R0 = 22 Ω 100R = 100 Ω 2K20 = 2.2 KΩ 22K0 = 22 KΩ 100K = 100 KΩ	P : PaperTaping (0603~1206) Q : PaperTaping (0402) E : Embossed Taping	04 : 4000 05 : 5000 10 : 10000	05 : ±5 10 : ±10 15 : ±15 25 : ±25	Z : Default code

Type Dimension



Unit : mm

TYPE	L	W	H	l_1	l_2
TP0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
TP0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TP0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
TP1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TP1210	3.10 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TP2010	5.00 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
TP2512	6.30 ± 0.15	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Item / Type	Rated Power at 70℃ (W)	Max Working Voltage (V)	Max Overload Voltage (V)	T.C.R. (PPM/℃)	Resistance Range (Ω) T ±0.01%	A ±0.05%	B ±0.1%	C ±0.25 %	D ±0.5%	F ±1.0%
TP0402	0.063	50	100	±5	49.9 ~ 20K		20 ~ 20 K			
				±10, ±15			10 ~ 100 K			
				±25, ±50			4.7 ~ 332 K			
TP0603	0.1	75	150	±5	24.9 ~ 62 K		20 ~ 62 K			
				±10, ±15	24.9 ~ 100 K	24.9 ~ 332 K	10 ~ 680 K			
				±25, ±50			4.7 ~ 1 M			
TP0805	0.125	150	300	±5	24.9 ~150 K		20 ~ 150 K			
				±10, ±15	24.9 ~ 200 K	24.9 ~ 511 K	10 ~ 1 M			
				±25, ±50			4.7 ~ 2 M			
TP1206	0.25	200	400	±5	24.9 ~ 300 K		20 ~ 300 K			
				±10, ±15	24.9 ~ 499 K	24.9 ~ 1M	10 ~ 1.5 M			
				±25, ±50			4.7 ~ 2.49 M			
TP1210	0.25	200	400	±5	24.9 ~ 300 K		20 ~ 300 K			
				±10, ±15	24.9 ~ 499 K	24.9 ~ 1M	10 ~ 1 M			
				±25, ±50			4.7 ~ 2.49 M			
TP2010	0.5	200	400	±5	24.9 ~ 300 K		20 ~ 300 K			
				±10, ±15	24.9 ~ 499 K	24.9 ~ 1M	10 ~ 1 M			
				±25, ±50			4.7 ~ 3 M			
TP2512	0.75	200	400	±5	24.9 ~ 300 K		20 ~ 300 K			
				±10, ±15	24.9 ~ 499 K	24.9 ~ 1M	10 ~ 1 M			
				±25, ±50			4.7 ~ 3 M			

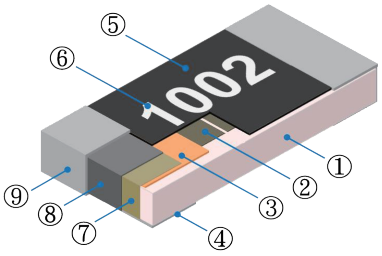
- Operating Temperature Range ：−55℃～＋155℃.
- For non-standard parts, please contact our sales department.

Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+125°C, 25°C is the reference temperature.	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(0.1%+0.05Ω) No Visual damage
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	±(0.2%+0.05Ω) No Visual damage
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155±5°C for 1000 hours.	±(0.2%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞	±(0.1%+0.05Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.1%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞 .	±(0.1%+0.05Ω)

AEC-Q200 Compliant Thin Film Chip Resistor

TQ Series



①	Alumina Substrate	④	Bottom Inner Electrode	⑦	Side Inner Electrode
②	Resistive Layer	⑤	Protective Overcoat	⑧	Nickel Barrier
③	Top Inner Electrode	⑥	Marking	⑨	Solder coating (Sn)

Applications

— Industrial electronics
— Communication devices
— Measuring instrument
— Converters

Features

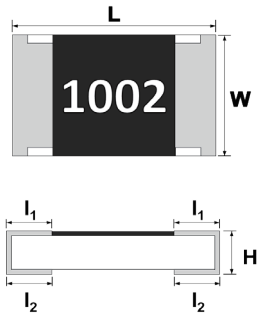
— Tolerance to ±0.05 %
— Low TCR to ±10 ppm/°C
— AEC-Q200 qualified
— Halogen free and lead free
— RoHS compliant

Parts Number Explanation

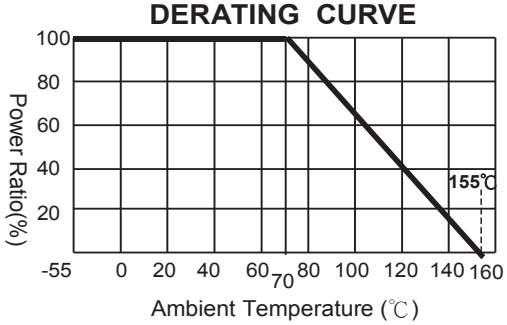
TQ	1206	B	10K0	P	05	25	Z
Product Type	**Size (Inch)**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm/℃)**	**Optional**
TQ Series AEC-Q200 Compliant Thin Film Chip Resistor	0402 0603 0805 1206	A : ±0.05% B : ±0.1% C : ±0.25% D : ±0.5% F : ±1%	4 digits EX. 10R0 = 10 Ω 100R = 100 Ω 2K20 = 2.2 KΩ 332K = 332 KΩ 1M00 = 1 MΩ	P : Paper Taping (0603~1206) Q : Pape Taping (0402) E : Embossed Taping	05 : 5000 10 : 10000	10 : ±10 15 : ±15 25 : ±25 50 : ±50	Z : Default Code

Type Dimension

Unit : mm



TYPE	L	W	H	I_1	I_2
TQ0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
TQ0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TQ0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
TQ1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range				
					A ±0.05%	B ±0.1%	C ±0.25%	D ±0.5%	F ±1.0%
TQ0402	0.063W	50V	100V	±10, ±15	49.9 Ω ~ 12 KΩ	10 Ω ~ 68 KΩ			
				±25, ±50		4.7 Ω ~ 220 KΩ			
TQ0603	0.1W	75V	150V	±10, ±15	49.9 Ω ~ 30 KΩ	10 Ω ~ 332 KΩ			
				±25, ±50		4.7 Ω ~ 680 KΩ			
TQ0805	0.125W	150V	300V	±10, ±15	49.9 Ω ~ 50 KΩ	10 Ω ~ 680 KΩ			
				±25, ±50		4.7 Ω ~ 1 MΩ			
TQ1206	0.25W	200V	400V	±10, ±15	49.9 Ω ~ 100 KΩ	10 Ω ~ 1 MΩ			
				±25, ±50		4.7 Ω ~ 1.5 MΩ			

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

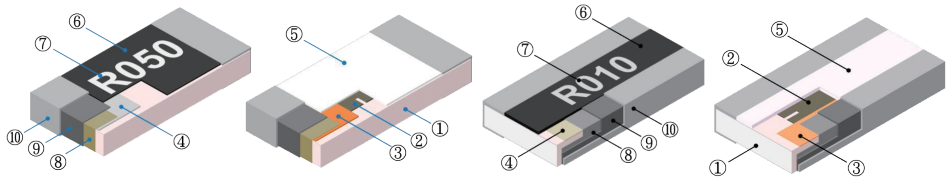
Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+125°C, 25°C is the reference temperature.	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(0.1%+0.05Ω) No Visual damage
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5°C for 30 seconds.	>95% Coverage No Visual damage
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10 seconds.	±(0.1%+0.05Ω) No Visual damage
Insulation Resistance	JJIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	±(0.3%+0.05Ω) No Visual damage
Resistance to Solvent	MIL-STD-202 Method 215	Add Aqueous wash chemical - OKEM Clean or equivalent.	±(0.1%+0.05Ω) No Visual damage
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.3%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion.	±(0.3%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.	±(0.3%+0.05Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	No Visual damage
Mechanical Shock	MIL-STD-202 Method 213	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration(D) is 6(ms).	±(0.1%+0.05Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 H.	±(0.1%+0.05Ω)
ESD	AEC-Q200- 002 or ISO/DIS 10605	Human body model 0402 : 400 V / 0603：1000 V 0805 : 1500 V / 1206：2000 V	±(0.5%+0.05Ω)
Solderability	J-STD-002	(1) 4 hrs 155°C dry heat. (2) 245±5°C 3 sec.	>95% Coverage No Visual damage
Terminal Strength (SMD)	AEC-Q200-006	Pressurizing force for 60 seconds 0402 / 0603：8N ; 0805 / 1206：17.7N	No broken
Board Flex	AEC-Q200-005	Beading once for 60 seconds 0402 / 0603 / 0805 / 1206：3mm	±(0.1%+0.05Ω)
Sulfur Test (FoS)	ASTM B809-95 ANSI/EIA-977	105±2°C, no power rating for 1000 hrs.	±(1.0%+0.05Ω)

Low-Resistance Metal Film Chip Resistor

TRL Series

①	Alumina Substrate
②	Resistive Layer
③	Bottom Inner Electrode (Cu)
④	Top Inner Electrode
⑤	Bottom Protective Overcoat White(≧39mR) Green(<39mR)
⑥	Top Protective Overcoat
⑦	Marking
⑧	Side Inner Electrode
⑨	Barrier Layer (Ni)
⑩	Solder coating (Sn)



Applications

— Consumer electronics
— Computer & relative products
— Communication devices
— Measuring instrument
— Industrial / Power supply
— Battery management system

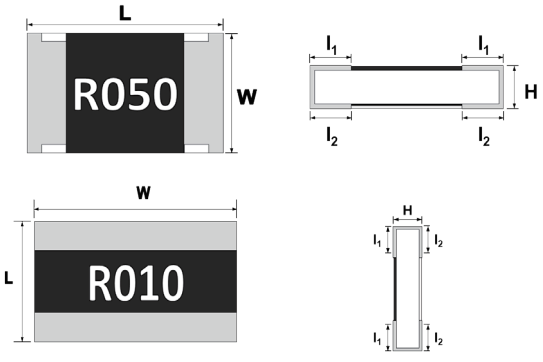
Features

— Low Resistance / TCR / Inductance(≦5nH)
— Excellent long-term stability
— High precision current sensing
— High power capability
— Halogen free and lead free
— RoHs compliant
— AEC-Q200 compliant

Parts Number Explanation

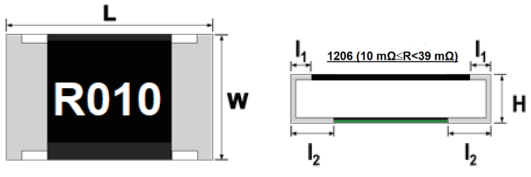
TRL	1206	05	F	R560	P	05	Z
Product Type	**Size (Inch)**	**Rated Power**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**Optional**
Metal Film Low-Resistance Chip Resistors	0201 0402 0603 0805 1206 1210 2010 2512 0508 0612 1020 1225	Y5：0.05W Y6：0.063W 01：0.10W X1：0.125W 02：0.20W X2：0.25W 04：0.40W 05：0.50W 07：0.75W 10：1.0W 15：1.5W 20：2.0W 30：3.0W	D：±0.5% F：±1% G：±2% J：±5%	EX. R056 = 0.056Ω R560 = 0.56Ω 1R00 = 1Ω	P：PaperTaping (0603~1206) Q：PaperTaping (0201~0402) E：Embossed Taping	04：4000 05：5000 10：10000	

Type Dimension



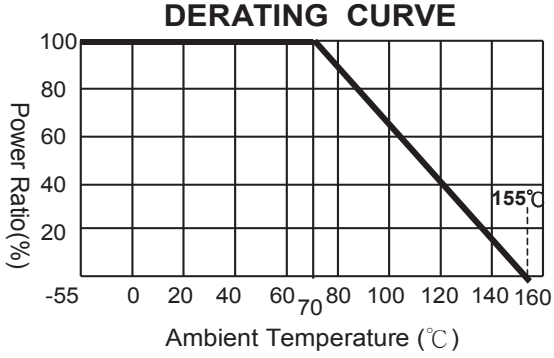
Unit：mm

TYPE	L	W	H	I_1	I_2
TRL0201	0.60±0.03	0.30±0.03	0.26±0.05	0.15±0.05	0.15±0.05
TRL0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
TRL0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.30±0.15
TRL0805	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.40±0.20
TRL1206	3.10±0.10	1.60±0.10	0.55±0.10	0.40±0.20	0.45±0.20
TRL1210	3.10±0.10	2.50±0.15	0.55±0.10	0.50±0.20	0.50±0.20
TRL2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
TRL2512	6.30±0.20	3.20±0.20	0.55±0.10	0.65±0.25	0.65±0.25
TRL2512(3W)	6.30±0.20	3.20±0.20	0.70±0.15	0.65±0.25	0.65±0.25
TRL0508	1.25±0.10	2.00±0.10	0.55±0.15	0.25±0.15	0.35±0.15
TRL0612	1.60±0.15	3.20±0.20	0.55±0.15	0.30±0.20	0.50±0.20
TRL1020	2.50±0.15	5.00±0.15	0.55±0.15	0.40±0.20	0.50±0.20
TRL1225	3.20±0.20	6.30±0.20	0.55±0.15	0.60±0.25	0.80±0.25



Unit：mm

TYPE	L	W	H	I_1	I_2
TRL1206 (10 mΩ≦R<39 mΩ)	3.30±0.20	1.70±0.20	0.65±0.2	0.20±0.15	0.68±0.20



Standard Electrical Specifications

Type	Rated Power at 70℃	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/℃)	Resistance Range	
					C(0.25%)	D(0.5%), F(1.0%), G(2.0%), J(5.0%)
TRL0201	1/20W	1.00A	2.50A	±100 --- ±50	-	50 mΩ ≦ R < 100 mΩ --- 100 mΩ ≦ R ≦ 10 Ω
	1/10W	1.41A	3.16A			
	1/5 W	2.00A	4.47A			
TRL0402	1/16W	1.12A	2.80A			
	1/8W	1.58A	3.54A			
	1/4W	2.24A	5.00A			
TRL0603	1/10W	1.41A	3.54A			
	1/5W	2.00A	4.47A			
	2/5W	2.83A	6.32A			
TRL0805	1/8W	1.79A	4.48A	±150 --- ±100 --- ±50	-	39 mΩ ≦ R < 50 mΩ --- 50 mΩ ≦ R < 100 mΩ --- 100 mΩ ≦ R ≦ 10 Ω
	1/4W	2.53A	5.66A			
	1/2W	3.58A	8.00A			
TRL1206	1/4W	2.53A	6.33A	±150 --- ±100 --- ±50	- --- - --- 470 mΩ ≦ R ≦ 10 Ω	39 mΩ ≦ R < 50 mΩ --- 50 mΩ ≦ R < 100 mΩ --- 100 mΩ ≦ R ≦ 10 Ω
	1/2W	3.58A	8.00A			
	3/4W	4.39A	9.81A			
	1W	5.06A	11.32A			
TRL1210	1/2W	3.58A	8.95A			
	1W	5.06A	11.32A			
TRL2010	3/4W	2.74A	6.85A	±50	470 mΩ ≦ R ≦ 10 Ω	100 mΩ ≦ R ≦ 10 Ω
	1.5W	3.87A	8.66A			
TRL2512	1W	3.16A	7.91A			
	2W	4.47A	10.00A			
	3W	5.48A	12.25A			

Type	Rated Power at 70℃	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/℃)	Resistance Range
					F(1.0%), G(2.0%), J(5.0%)
TRL1206	1/4W	5.00A	12.50A	±200	10 mΩ ≦ R < 39 mΩ
	1/2W	7.07A	15.81A		

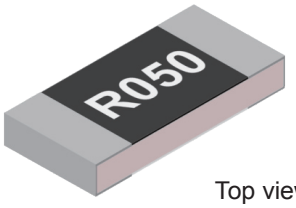
Wide Terminal Type:

Type	Rated Power at 70℃	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/℃)	Resistance Range			
					D (0.5%)	F (1.0%)	G (2.0%)	J (5.0%)
TRL0508	1W	10.00A	22.36A	±150	-	10mΩ≦R＜20mΩ		
				±100	100mΩ≦R≦500mΩ	20mΩ≦R≦500mΩ		
TRL0612	1W	10.00A	22.36A	±150	-	10mΩ≦R＜20mΩ		
				±100	100mΩ≦R≦500mΩ	20mΩ≦R≦500mΩ		
TRL1020	2W	14.14A	31.62A	±150	-	10mΩ≦R＜20mΩ		
				±100	100mΩ≦R≦500mΩ	20mΩ≦R≦500mΩ		
TRL1225	3W	17.32A	38.73A	±150	-	10mΩ≦R＜20mΩ		
				±100	100mΩ≦R≦500mΩ	20mΩ≦R≦500mΩ		

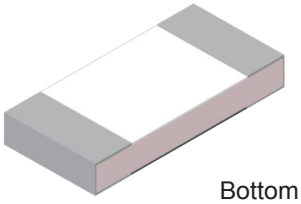
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.
- If you need reliability testing, please contact our sales department

Anti-Sulfur Low-Resistance Metal Film Chip Resistor

TSL Series



Top view


Bottom view

■ Applications

— Consumer electronics
— Computer & relative products
— Communication devices
— Measuring instrument
— Industrial / Power supply
— Battery management system

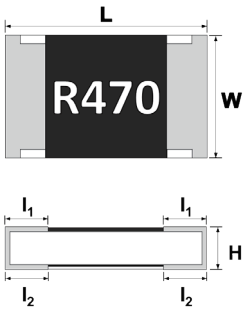
■ Features

— Low Resistance / TCR / Inductance(≦5nH)
— High precision current sensing
— High power capability
— Sulfur resistant
— Halogen free and lead free
— RoHs compliant

■ Parts Number Explanation

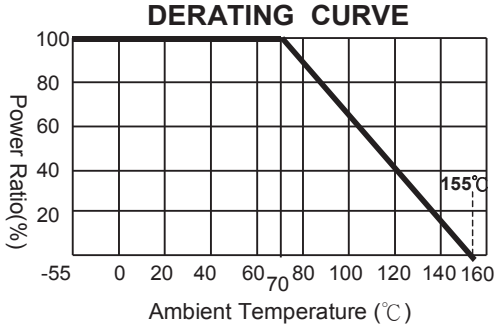
TSL	1206	05	F	R560	P	05	Z
Product Type	**Size (Inch)**	**Rated Power**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**Optional**
Anti-Sulfur Metal Film Low-Resistance Chip Resistors	0402 0603 0805 1206 1210 2010 2512	Y6：0.063W 01：0.10W X1：0.125W 02：0.20W X2：0.25W 04：0.40W 05：0.50W 07：0.75W 10：1.0W 15：1.5W 20：2.0W	D：±0.5% F：±1% G：±2% J：±5%	EX. R056 = 0.056Ω R560 = 0.56Ω 1R00 = 1Ω	P：PaperTaping (0603~1206) Q：PaperTaping (0402) E：Embossed Taping	04：4000 05：5000 10：10000	Z：Default Code

■ Type Dimension



Unit：mm

TYPE	L	W	H	I_1	I_2
TSL0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
TSL0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.30±0.15
TSL0805	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.40±0.20
TSL1206	3.10±0.10	1.60±0.10	0.55±0.10	0.40±0.20	0.45±0.20
TSL1210	3.10±0.10	2.50±0.15	0.55±0.10	0.50±0.20	0.50±0.20
TSL2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
TSL2512	6.30±0.20	3.20±0.20	0.55±0.10	0.65±0.25	0.65±0.25



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Type	Rated Power at 70℃	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/℃)	Resistance Range D(0.5%), F(1.0%), G(2.0%), J(5.0%)
TSL0402	1/16W	1.12A	2.80A	±100 ---------- ±50	50 mΩ ≦ R < 100 mΩ ---------- 100 mΩ ≦ R ≦ 10 Ω
	1/8W	1.58A	3.54A		
	1/4W	2.24A	5.00A		
TSL0603	1/10W	1.41A	3.54A		
	1/5W	2.00A	4.47A		
	2/5W	2.83A	6.32A		
TSL0805	1/8W	1.58A	3.95A		
	1/4W	2.24A	5.00A		
	1/2W	3.16A	7.07A		
TSL1206	1/4W	2.24A	5.59A		
	1/2W	3.16A	7.07A		
	1W	4.47A	10.00A		
TSL1210	1/2W	3.16A	7.91A		
	1W	4.47A	10.00A		
TSL2010	3/4W	2.74A	6.85A	±50	100 mΩ ≦ R ≦ 10 Ω
	1.5W	3.87A	8.66A		
TSL2512	1W	3.16A	7.91A		
	2W	4.47A	10.00A		

- If there are other TCR or power requirements, please contact our sales department.

Reliability Test and Requirement

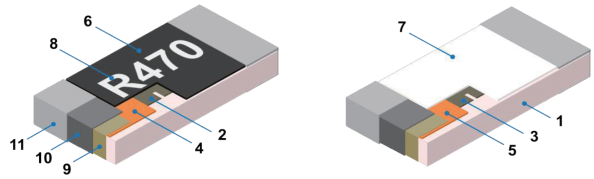
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C /+125°C, 25°C is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	Standard power：6.25 times rated power whichever is less for 5 seconds. High power (2X/4X)：5 times rated power whichever is less for 5 seconds.	±(1.0%+0.001Ω)
Dielectric Withstanding Voltage	JIS-C5201-1 4.7	0805、1206、1210、2010、2512 applied 500VAC for 1 minute. 0402、0603 applied 300VAC for 1 minute.	No short or burned on the appearance.
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force：10N , 10 seconds	No broken
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	±(1.0%+0.001Ω) No Visual damage
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working current whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞	±(1.0%+0.001Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.5%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, Rated power, or Max. working current whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞 .	±(1.0%+0.001Ω)
High Temperature Exposure	JIS-C5201-1 4.25 IEC-60068-2-2	At 155±5°C for 1000 hours.	±(1.0%+0.001Ω)
Terminal Strength	JIS-C5201-1 4.32 AEC-Q200-006	Pressurizing force for 10 seconds 0402 / 0603：8N ; 0805 and above：17.7N	No broken
Sulfur Test (FoS)	ASTM B809-95 ANSI/EIA-977	105±2°C, no power rating for 1000 hrs.	±(2.0%+0.001Ω)

- Temperature Coefficient of Resistance test to - 55 °C is available on request
- We can also provide AEC-Q200 test reports if required by customers.

Anti-Surge Low-Resistance Metal Film Chip Resistor

TGL Series

1	Alumina Substrate
2	Top Resistive Layer
3	Bottom Resistive Layer
4	Top Inner Electrode (Cu)
5	Bottom Inner Electrode (Cu)
6	Top Protective Overcoat
7	Bottom Protective Overcoat
8	Marking
9	Side Inner Electrode
10	Barrier Layer (Ni)
11	Solder coating (Sn)



Application

— Consumer electronics
— Computer & relative products
— Communication devices
— Measuring instrument
— Industrial / Power supply
— Battery management system

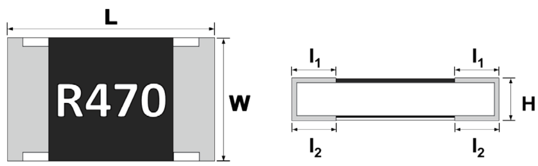
Features

— Low Resistance / TCR / Inductance(≦5nH)
— Excellent long-term stability
— High precision current sensing
— High rated power capability and excellent Anti-Surge
— Halogen free and lead free
— RoHs compliant

Parts Number Explanation

TGL	1206	10	F	R470	P	05	Z
Product Type	**Size (Inch)**	**Rated Power**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**Optional**
Metal Film Anti-Surge Low-Resistance Chip Resistors	1206 1210 2010 2512	10：1.0W 15：1.5W 20：2.0W 30：3.0W 35：3.5W	D：±0.5% F：±1% G：±2% J：±5%	EX. R470 = 0.47Ω 4R70 = 4.7Ω 47R0 = 47Ω	P：Paper Taping E：Embossed Taping	04：4000 05：5000	Z : Normal U : Ultra Power

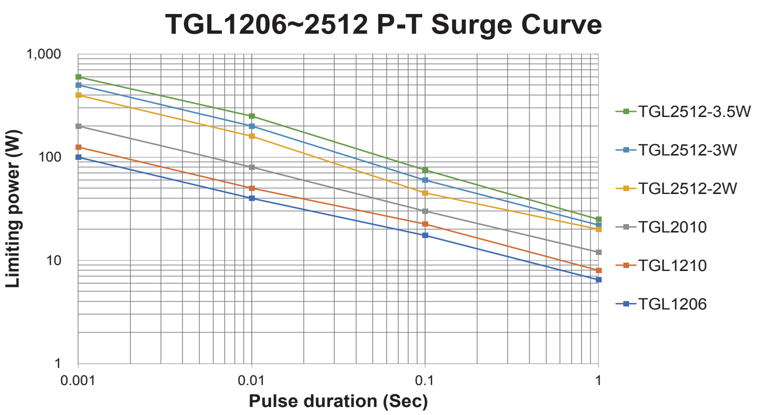
Type Dimension

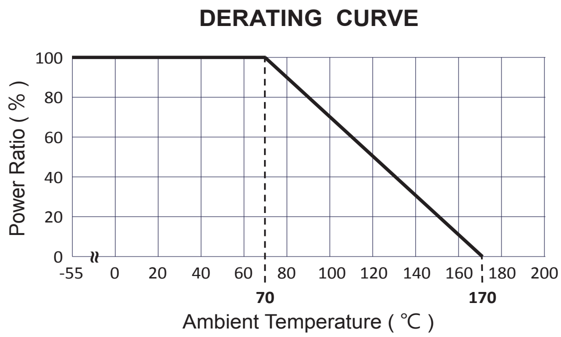


Unit：mm

TYPE	L	W	H	l_1	l_2
TGL1206	3.10±0.10	1.60±0.10	0.55±0.10	0.40±0.20	0.45±0.20
TGL1210	3.10±0.10	2.50±0.15	0.55±0.10	0.50±0.20	0.50±0.20
TGL2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
TGL2512	6.30±0.20	3.20±0.20	0.55±0.10	0.65±0.25	0.65±0.25
TGL2512(U)	6.30±0.20	3.20±0.20	0.70±0.15	0.65±0.25	0.65±0.25

Anti-Surge Ability:





Standard Electrical Specifications

Type	Rated Power at 70℃	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/℃)	Resistance Range D(0.5%), F(1.0%), G(2.0%), J(5.0%)
TGL1206	1W	4.47A	10.00A	±100	50 mΩ ≦ R < 100 mΩ
TGL1210	1W	4.47A	10.00A	±50	100 mΩ ≦ R ≦ 33 Ω
TGL2010	1.5W	5.48A	12.25A	±50	50 mΩ ≦ R ≦ 50 Ω
TGL2512	2W	6.32A	14.14A		
	3.5W(U)	8.37A	18.71A		

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋170℃.

Reliability Test and Requirement

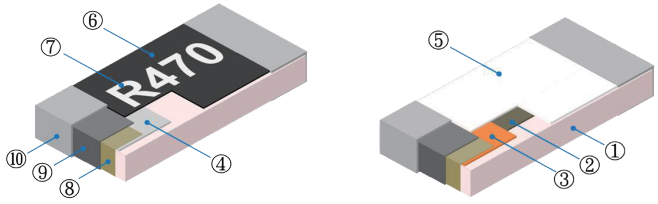
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C / +125°C, 25°C is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	5 times rated power whichever is less for 5 seconds.	±(1.0%+0.001Ω)
Dielectric Withstanding Voltage	JIS-C5201-1 4.7	Applied 500VAC for 1 minute.	No short or burned on the appearance.
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force：10N , 10 seconds	No broken
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles	±(1.0%+0.001Ω) No Visual damage
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working current whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞	±(1.0%+0.001Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(1.0%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, Rated power, or Max. working current whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞 .	±(1.0%+0.001Ω)
High Temperature Exposure	JIS-C-5201-1 4.23.2 IEC-60068-2-2	At +170±5°C for 1000 hours.	±(1.0%+0.001Ω)
Terminal Strength (SMD)	JIS-C5201-1 4.32 AEC-Q200-006	Pressurizing force for 60 seconds 1206 and above：17.7N	No broken

- Temperature Coefficient of Resistance test to - 55 ℃ is available on request
- We can also provide AEC-Q200 test reports if required by customers.

Ultra Anti-Surge Low-Resistance Metal Film Chip Resistor

TUL Series

①	Alumina Substrate
②	Resistive Layer
③	Bottom Inner Electrode (Cu)
④	Top Inner Electrode
⑤	Bottom Protective Overcoat
⑥	Top Protective Overcoat
⑦	Marking
⑧	Side Inner Electrode
⑨	Barrier Layer (Ni)
⑩	Solder coating (Sn)



Application

— Consumer electronics
— Computer & relative products
— Communication devices
— Measuring instrument
— Industrial / Power supply
— Battery management system

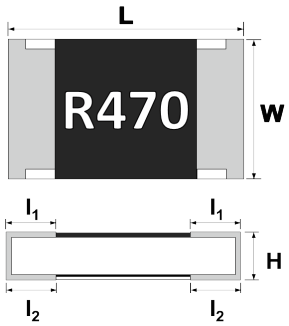
Features

— Low Resistance / TCR
— Excellent high-frequency characteristics(≦2nH)
— Excellent long-term stability
— High precision current sensing
— Ultra Anti-surge characteristics superior to standard Others metal film resistors
— Halogen free and lead free
— RoHS compliant
— AEC-Q200 compliant

Parts Number Explanation

TUL	2512	30	F	R470	E	04	Z
Product Type	**Size (Inch)**	**Rated Power**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**Optional**
Ultra Anti-Surge Low-Resistance Metal Film Chip Resistors	2512	20 : 2.0W 30 : 3.0W	D : ± 0.5% F : ± 1% G : ± 2% J : ± 5%	EX. R180 = 0.18Ω R470 = 0.47Ω	E : Embossed Taping	04 : 4000	Z : Default Code

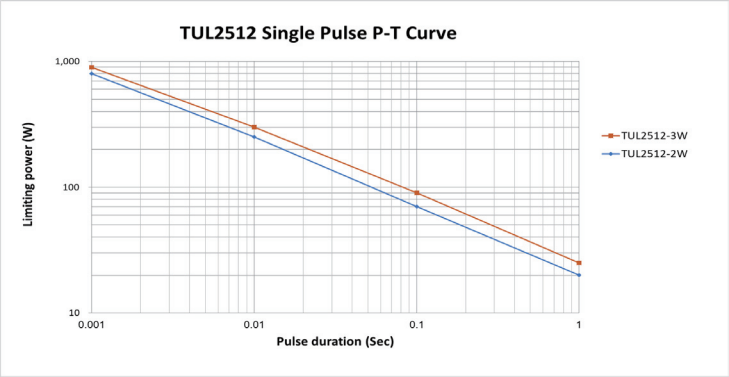
Type Dimension

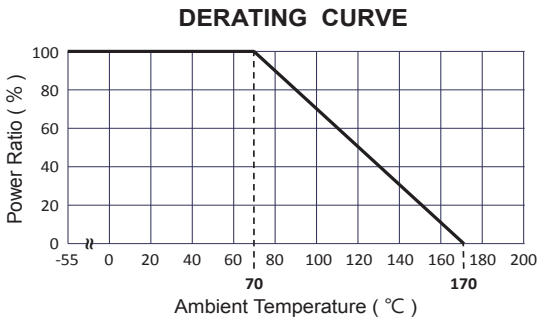


Unit : mm

TYPE	L	W	H	l_1	l_2
TUL2512 (2W)	6.30±0.20	3.20±0.20	0.55±0.10	0.65±0.25	0.65±0.25
TUL2512 (3W)	6.30±0.20	3.20±0.20	0.70±0.15	0.65±0.25	0.65±0.25

Anti-Surge Ability:





Standard Electrical Specifications

Type	Rated Power at 70℃	Max. Rated Current	Max. Overload Current	T.C.R. (ppm/℃)	Resistance Range D(0.5%), F(1.0%), G(2.0%), J(5.0%)
TUL2512	2 W	4.47 A	10.00 A	±50	100 mΩ ≦ R ≦ 510 mΩ
TUL2512	3 W	5.48 A	12.25 A		

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋170℃.

Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C / +125°C, 25°C is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	5 times rated power whichever is less for 5 seconds.	±(1.0%+0.001Ω)
Dielectric Withstanding Voltage	JIS-C5201-1 4.7	Applied 500VAC for 1 minute.	No short or burned on the appearance.
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force：10N , 10 seconds	No broken
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 300 cycles.	±(1.0%+0.001Ω) No Visual damage
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working current whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	±(1.0%+0.001Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(1.0%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, Rated power, or Max. working current whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	±(1.0%+0.001Ω)
High Temperature Exposure	JIS-C-5201-1 4.23.2 IEC-60068-2-2	At +170±5°C for 1000 hours.	±(1.0%+0.001Ω)
Terminal Strength (SMD)	JIS-C5201-1 4.32 AEC-Q200-006	Pressurizing force for 60 seconds 2512：17.7N	No broken

- Temperature Coefficient of Resistance test to - 55 ℃ is available on request

Low Resistance Metal Strip Chip Resistor

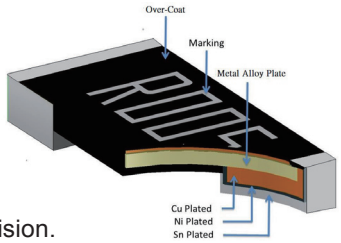
MA Series

■ Application

— Entertainment product
— Power supply
— Measuring instrument
— Industrial product
— Battery management system

■ Features

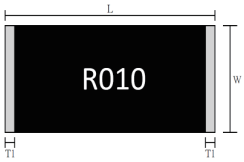
— Low Resistance / Low TCR
— Excellent long term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.
— AEC-Q200 qualified available.



■ Parts Number Explanation

MA	2512	20	F	R001	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	0805 1206 2512 2725 2728 4527 3637	05= 0.5W 07= 0.75 W 10= 1.00 W 20= 2.00 W 30= 3.00 W 40= 4.00 W 50= 5.00 W 70= 7.00 W	D : ±0.5 % F : ±1 % G : ±2 % J : ±5 %	0m20= 0.2 mR 2m50= 2.5 mR R000= 0 mR R005= 5.0 mR R100= 100 mR R500= 500 mR	S : MnCuSn M : MnCu F : FeCrAl C : Cu	Z : Default code

■ Type Dimension



Unit : mm

Type	Power Rating	Resistance Range	L	W	H	T1	T2
MA0805	0.5W 1W	0.5mΩ	2.05±0.25	1.30±0.30	0.60±0.20	----	0.75±0.20
		1mΩ			0.55±0.20		0.40±0.20
		1.5mΩ			0.45±0.20		
		2mΩ			0.35±0.20		
		2.5mΩ			0.45±0.20		
		3~8mΩ			0.35±0.20		
		9~13mΩ			0.37±0.20		
MA1206	0.5w 0.75W	1mΩ	3.200±0.254	1.650±0.254	0.820±0.254	0.508±0.254	0.508±0.254
		2mΩ			0.700±0.254		
		3mΩ			0.600±0.254		
		4~20mΩ			0.550±0.254		
		21~50mΩ			0.470±0.254		
		51~75mΩ			0.400±0.254		
	1W	1mΩ			0.820±0.254		
		2mΩ			0.700±0.254		
		3mΩ			0.600±0.254		
		4~20mΩ			0.550±0.254		
		21~50mΩ			0.470±0.254		
	1.5W	1mΩ			0.820±0.254		
		2mΩ			0.700±0.254		
		3mΩ			0.600±0.254		
		4~10mΩ			0.550±0.254		
MA2512	1W 2W	0.5mΩ	6.350±0.254	3.050±0.254	0.820±0.254	1.980±0.254	2.000±0.254
		0.75mΩ			0.700±0.254	1.150±0.254	1.980±0.254
		1mΩ			0.720±0.254		2.200±0.254
		1.5mΩ					1.400±0.254
		2~5mΩ					1.150±0.254
		6mΩ			0.550±0.254		1.100±0.254
		7~10mΩ			0.600±0.254		
		11~75mΩ			0.600±0.254	1.050±0.254	
		76~100mΩ			0.550±0.254	0.750±0.254	
		101~135mΩ			0.470±0.254		
		136~200mΩ			0.400±0.254		
		201~450mΩ					0.850±0.254
	3W	0.5mΩ	6.350±0.254	3.050±0.254	0.820±0.254	1.980±0.254	2.000±0.254
		0.75mΩ			0.700±0.254	1.150±0.254	1.980±0.254
		1mΩ			0.720±0.254		2.200±0.254
		1.5mΩ					1.400±0.254
		2~5mΩ					1.150±0.254
		6mΩ			0.550±0.254	0.75±0.254	1.100±0.254
		7~10mΩ			0.600±0.254	1.150±0.254	
		11~75mΩ				0.75±0.254	
		76~100mΩ			0.550±0.254		

Unit : mm

Type	Power Rating	Resistance Range	L	W	H	T1	T2
MA2725	4W	0.2mΩ	6.900±0.254	6.350±0.254	1.100±0.254	1.20±0.254	2.150±0.254
		0.25mΩ			0.950±0.254		2.287±0.254
		0.3mΩ					1.975±0.254
		0.35mΩ					1.710±0.254
		0.4mΩ					1.440±0.254
		0.5mΩ			0.850±0.254		2.080±0.254
		0.6mΩ					1.780±0.254
		0.8mΩ					1.300±0.254
		1mΩ	6.800±0.254		0.650±0.254	1.15±0.254	1.800±0.254
		1.5~1.6mΩ					1.500±0.254
		2~3mΩ			0.550±0.254		
MA2728	4W	4~450mΩ	6.600±0.254	6.700±0.254	0.580±0.254	0.400±0.254	1.050±0.254
MA4527	2W	0.5mΩ	11.300±0.500	6.600±0.500	0.770±0.254	0.900±0.254	3.000±0.254
		1mΩ			0.650±0.254		2.000±0.254
		1.5~20mΩ					
		21~100mΩ			0.550±0.254		
	3W	0.5mΩ			0.770±0.254	0.900±0.254	3.000±0.254
		1mΩ			0.650±0.254		2.000±0.254
		1.5~20mΩ					
		21~60mΩ			0.550±0.254		
	5W	0.5mΩ			0.800±0.254	0.650±0.254	3.000±0.254
		1mΩ			0.680±0.254		2.000±0.254
		1.5~20mΩ					
		21~500mΩ			0.580±0.254		
MA3637	7W	0.3mΩ	9.140±0.254	9.600±0.254	0.73±0.254	2.30±0.254	2.30±0.254

Unit : mm

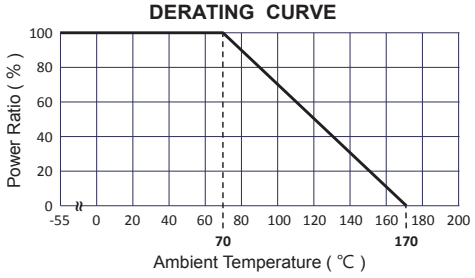
Type	Power Rating	Resistance Range	L	W	H	T1	T2
MA0805	0.5W / 1W	≦0.2mΩ	2.05±0.25	1.300±0.30	0.45±0.20	0.40±0.20	
MA1206	1W	< 0.2mΩ	3.200±0.254	1.650±0.254	0.650±0.254	0.508±0.254	0.508±0.254
MA2512	2W / 3W	< 0.2mΩ	6.350±0.254	3.050±0.254	0.650±0.254	1.15±0.254	1.100±0.254

■ Jumper Specifications

Type	Rating Power at 70℃	Max. Rating Current	Resistance (mΩ)	Material	Operating Temperature Range (℃)
MA0805	0.5W	50A	≦0.2mΩ	Jumper : Cu	-55~+170°C
	1W	70.7A			
MA1206	1W	70.7A			
MA2512	2W	100A			
	3W	122A			

- **Operating Temperature Range (℃) : - 55 ~ + 170**

DERATING CURVE



Standard Electrical Specifications

TYPE	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)		Material
					0.5% (D)	1.0% (F) 2.0% (G) 5.0% (J)	
MA0805	0.5W	≦±100	31.62	70.71	---	0.5~1	R0005~R002 : MnCuSn R0025~R008 : MnCu R009~R013 : FeCrAl
		≦±75	18.26	40.82	---	1.5~2	
		≦±50	14.14	31.62	7~13	2.5~13	
	1W	≦±100	44.72	89.44	---	0.5~1	
		≦±75	25.81	51.63	---	1.5~2	
		≦±50	20.0	40.0	7~13	2.5~13	
MA1206	0.5W	≦±50	22.36	50.00	5~75	1~75	R001 : MnCuSn R002~R007 : MnCu R008~R075 : FeCrAl
	0.75W		27.38	54.77			
	1W		31.62	63.24	5~50	1~50	R001 : MnCuSn R002~R007 : MnCu R008~R050 : FeCrAl
	1.5W		38.72	77.49	5~10	1~10	R001 : MnCuSn R002~R007 : MnCu R008~R010 : FeCrAl
MA2512	1W	≦±75	44.72	100.00	---	0.5~0.75	R0005~R00075 : MnCuSn
	1W	≦±50	31.62	70.71	5~450	1~450	R001~R006 : MnCu R007~R450 : FeCrAl
	2W	≦±75	63.24	141.42	---	0.5~0.75	R0005~R00075 : MnCuSn
	2W	≦±50	44.72	100.00	5~450	1~450	R001~R006 : MnCu R007~R450 : FeCrAl
	3W	≦±75	77.45	173.20	---	0.5~0.75	R0005~R00075 : MnCuSn
	3W	≦±50	54.77	122.47	5~100	1~100	R001~R006 : MnCu R007~R100 : FeCrAl
MA2725	4W	≦±100	141.42	282.84	---	0.2	R0002~R0004 : MnCuSn R0005~R0025 : MnCu R003 : FeCrAl
		≦±50	126.49	252.98		0.25~3	
MA2728	4W	≦±50	31.62	63.24	7~450	4~450	R004~R450 : FeCrAl
MA4527	2W	≦±75	63.24	141.42	---	0.5	R0005 : MnCuSn
	2W	≦±50	44.72	100.00	5~100	1~100	R001~R040 : MnCu R041~R100 : FeCrAl
	3W	≦±75	77.45	173.20	---	0.5	R0005 : MnCuSn
	3W	≦±50	54.77	122.47	5~60	1~60	R001~R040 : MnCu R041~R060 : FeCrAl
	5W	≦±75	100.00	173.20	---	0.5	R0005 : MnCuSn
	5W	≦±50	70.71	122.47	5~500	1~500	R001~R040 : MnCu R041~R500 : FeCrAl
MA3637	7W	≦±100	152.75	341.57	---	0.3	R0003 : MnCuSn

- **Operating Temperature Range (℃) : - 55 ~ + 170**

Reliability test and requirement

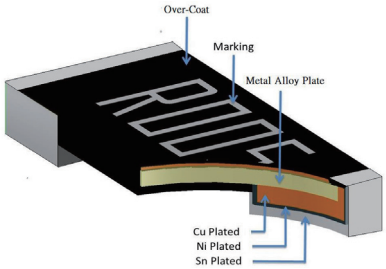
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25℃ /+150℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: ● MA0805-0.5W: 5 times of rated powe ● MA0805-1W: 4 times of rated power ● MA1206-0.5W: 5 times of rated powe ● MA1206-0.75W: 4 times of rated powe ● MA1206-1W: 4 times of rated power ● MA1206-1.5W: 4 times of rated power ● MA2512-1W: 5 times of rated power ● MA2512-2W: 5 times of rated power ● MA2512-3W: 5 times of ratedpower*(Note)* ● MA2725-4W: 4 times of rated power ● MA2728-4W: 4 times of rated power ● MA4527-2W: 5 times of rated power ● MA4527-3W: 5 times of rated power ● MA4527-5W: 3 times of rated power ● MA3637-7W: 5 times of rated power for 5 seconds.	● MA4527: ΔR/R1≦±2.0% ● The others: ΔR/R1≦±0.5%
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 170℃ for 1000 hours.	● MA4527: ΔR/R1≦±2.0% ● The others: ΔR/R1≦±1.0%
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	ΔR/R1≦± 0.5%
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	● MA4527: ΔR/R1≦±2.0% ● The others: ΔR/R1≦±1.0%
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	>95% coverage

Low Inductance Metal Strip Chip Resistor

MAL Series

■ Application

— Entertainment product
— Power supply
— Measuring instrument
— Industrial product
— Battery management system



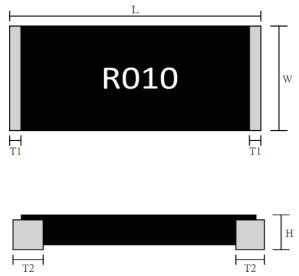
■ Features

— Low Resistance / Low TCR/Low Inductance(≦5nH)
— Excellent long term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.

■ Parts Number Explanation

MAL	2512	20	F	R001	M	Z
Product Type	**Size (Inch)**	**Rated Power**	**Tolerance**	**Resistance**	**Material**	**Optional**
Low-Inductance Metal Alloy Low Resistance Resistor	1206 2512 4527	10=1.00W 15=1.50W 20=2.00W 30=3.00W 50=5.00W	F：±1% J：±5%	0m50=0.5mR 2m50=2.5mR R005=5.0mR R250=250mR	S：MnCuSn M：MnCu R：NiCrAl	Z：Default code

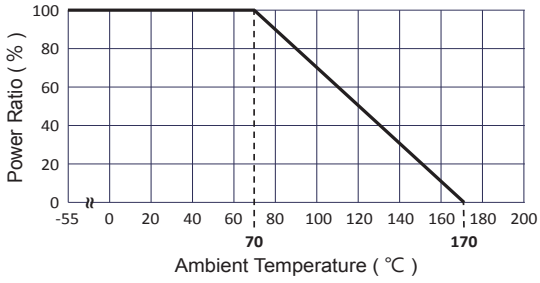
■ Type Dimension



Unit：mm

Type	Power Rating	Resistance Range	L	W	H	T1	T2
MAL1206	1W	1mΩ	3.200±0.254	1.650±0.254	0.770±0.254	0.508±0.254	0.508±0.254
		2 mΩ			0.650±0.254		
		3~10 mΩ			0.550±0.254		
MAL2512	1W & 1.5W	101~200	6.350±0.254	3.050±0.254	0.400±0.254	0.75±0.254	1.100±0.254
		201~250 mΩ					0.850±0.254
	1.5W & 2W	0.5mΩ			0.820±0.254	1.980±0.254	2.000±0.254
		0.75mΩ			0.700±0.254	1.150±0.254	1.980±0.254
		1mΩ			0.720±0.254		2.200±0.254
		1.5mΩ					1.400±0.254
		2~5mΩ					1.150±0.254
		6 mΩ			0.550±0.254	0.75±0.254	1.100±0.254
		7~15 mΩ					
		16~100 mΩ			0.500±0.254		
	3W	0.5mΩ			0.820±0.254	1.980±0.254	2.000±0.254
		0.75mΩ			0.700±0.254	1.150±0.254	1.980±0.254
		1mΩ			0.720±0.254		2.200±0.254
		1.5mΩ					1.400±0.254
		2~5mΩ					1.150±0.254
		6 mΩ			0.550±0.254	0.75±0.254	1.100±0.254
		7 ~15mΩ					
		16~20 mΩ			0.500±0.254		
MAL4527	2W & 3W	0.5mΩ	11.30±0.50	6.60±0.50	0.770±0.254	0.90±0.254	3.000±0.254
		1mΩ			0.650±0.254		2.000±0.254
		1.5~20mΩ					
		21~40 mΩ			0.550±0.254		
	5W	0.5mΩ			0.800±0.254	0.65±0.254	3.000±0.254
		1mΩ			0.680±0.254		2.000±0.254
		1.5~20mΩ					
		21~40 mΩ			0.580±0.254		

DERATING CURVE



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

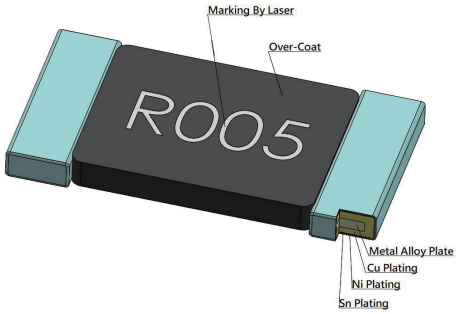
TYPE	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)		Material	Operating Temperature Range (℃)
					0.5% (D)	1.0% (F) 2.0% (G) 5.0% (J)		
MAL1206	1W	≦±50	31.62	63.24	7~10	1~10	R001：MnCuSn R002~R010:MnCu	- 55 ~ + 170
MAL2512	1W & 1.5W	≦±75	54.77	109.54	-	0.5~0.75	R0005~R00075：MnCuSn R001~R015：MnCu R016~R250：NiCrAl	
		≦±50	38.72	77.45	7~250	1~250		
	2W	≦±75	63.24	126.49	-	0.5~0.75		
		≦±50	44.72	89.44	7~100	1~100		
	3W	≦±75	77.45	154.91	-	0.5~0.75		
		≦±50	54.77	109.54	7~20	1~20		
MAL4527	2W	≦±75	63.24	141.42	-	0.5	R0005：MnCuSn R001~R040：MnCu	
		≦±50	44.72	100.0	7~40	1~40		
	3W	≦±75	77.45	173.20	-	0.5		
		≦±50	54.77	122.47	7~40	1~40		
	5W	≦±75	100.00	200.00	-	0.5		
		≦±50	70.71	141.42	7~40	1~40		

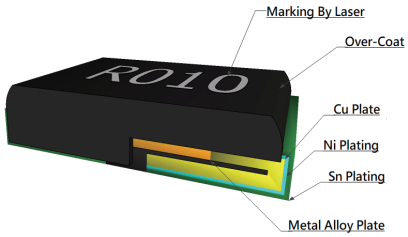
Reliability test and requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25℃ /+150℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS C 5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: • MAL 1206-1W: 4 times of rated power • MAL 2512-1.5W: 5 times of rated power • MAL 2512-2W: 5 times of rated power • MAL 2512-3W: 4 times of rated power • MAL 4527-2W: 5 times of rated power • MAL 4527-3W: 5 times of rated power • MAL 4527-5W: 4 times of rated power Rating power duration: 5secs	• MAL4527: ΔR/R1≦±2.0% • Other: ΔR/R1≦±1.0%
High Temperature Exposure	JIS C 5201-1 4.23.2 IEC 60068-2-2	1,000hrs at + 170 °C	• MAL4527: ΔR/R1≦±2.0% • Other: ΔR/R1≦±1.0%
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme	ΔR/R1≦± 0.5%
Bias Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦± 0.5%
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	• MAL4527: ΔR/R1≦±2.0% • Other: ΔR/R1≦±1.0%
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	>95% coverage
Moisture Resistance	MIL-STD 202 Method 106	T=24 hours / Cycle ,10Cycles . Steps 7a& 7b not required. Unpowered . (Figure 1)	ΔR/R1≦± 0.5%

Low Resistance Metal Strip Molding Chip Resistor

MR Series





■ Application

— Entertainment equipment
— Power Supply
— Measuring instrument
— Industrial equipment
— Battery management system

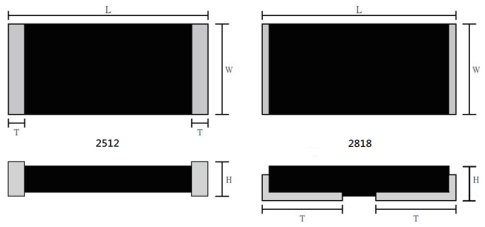
■ Features

— Low Resistance / Low TCR/ Low Inductance(Only *Z)
— Excellent long term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.
— AEC-Q200 compliant

■ Parts Number Explanation

MR	2512	20	F	R004	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	2512 2818	20=2.00W 30=3.00W 50=5.00W	F：±1% G：±2% J：±5%	R005=5.0mR R010=10mR	M：MnCu F：FeCrAl R：NiCrAl	Z:Normal Type (Low inductance) G:Anti-Surge Type

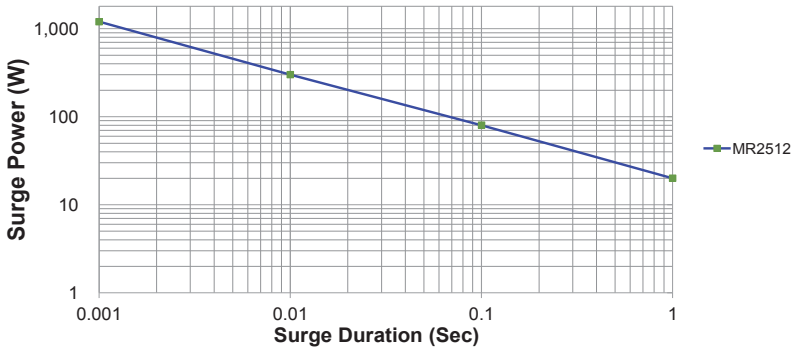
■ Type Dimension



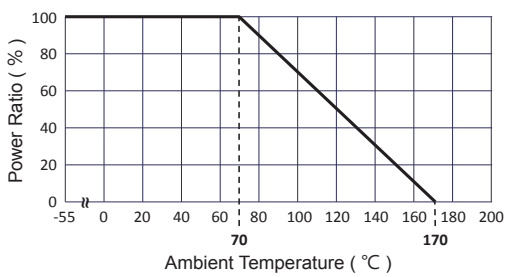
Unit：mm

Type	Power Rating	Resistance Range	L	W	H	T
MR2512*Z	2W	2~20mΩ(MnCu)	6.35±0.254	3.10±0.254	0.70±0.254	0.95±0.254
	3W	2~15mΩ(MnCu)			0.70±0.254	0.95±0.254
MR2512*G	2W	1mΩ(MnCu)			0.90±0.254	1.9±0.254
	2W	2mΩ~4mΩ(MnCu)			0.90±0.254	0.80±0.254
	2W	5mΩ~50mΩ(FeCrAl)			0.90±0.254	0.80±0.254
	3W	1mΩ~3mΩ(MnCu)			1.10±0.254	0.80±0.254
	3W	4mΩ(FeCrAl)			1.10±0.254	0.80±0.254
	3W	5mΩ~50mΩ(FeCrAl)			0.90±0.254	0.80±0.254
MR2818*Z MR2818*G	5W	4~50mΩ	7.15±0.254	4.95±0.254	1.65±0.254	2.90±0.254

MR2512G P-T Single Surge Curve**



DERATING CURVE



Standard Electrical Specifications

Type	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ) 1.0% (F) 2.0% (G) 5.0% (J)	Material	Operating Temperature Range (℃)
MR2512*Z	2W	≦±50	31.62A	70.71A	2~20	R002~R020：MnCu	- 55 ~ + 170
	3W	≦±50	38.73A	86.6A	2~15	R002~R015：MnCu	
MR2512*G	2W	≦±100	44.72A	100.00A	1	R001~R004 : MnCu R005~R050 : FeCrAl	
		≦±50	31.62A	70.71A	2~50		
	3W	≦±100	54.77A	122.47A	1	R001~R003 : MnCu R004~R050 : FeCrAl	
		≦±50	38.73A	86.60A	2~50		
MR2818*Z	5W	≦±200	35.35A	70.71A	4~6	R004~R007：MnCu	
		≦±75	25A	50A	7~50	R008~R050：NiCrAl	
MR2818*G		≦±75	25A	50A	7~50	R008~R050：FeCrAl	

Note: MR 2818 8mR~50mR use FeCrAl (*G) is preferred. If it is applied to the requirement of waveform frequency, NiCrAl (*Z) must be Used instead.

Note: Inductance characteristics MR 2512*Z, MR 2818*Z ≦5nH

Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25℃ /+125℃, 25℃ is the reference temperature	Refer to Ratings
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: ● MR2512-2W: 5 times of rated power ● MR2512-3W: 5 times of rated power ● MR2818-5W: 4 times of rated power for 5 seconds.	ΔR/R1≦±1.0%
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 170℃ for 1000 hours.	ΔR/R1≦±1.0%
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	ΔR/R1≦±1.0%
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±1.0%
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	ΔR/R1≦±1.0%
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	>95% coverage
Moisture Resistance	MIL-STD 202 Method 106	T=24 hours / Cycle ,10Cycles . Steps 7a& 7b not required. Unpowered . (Figure 1)	ΔR/R1≦± 0.5%

Low Resistance Metal Strip Chip Resistor

MRE Series

Application

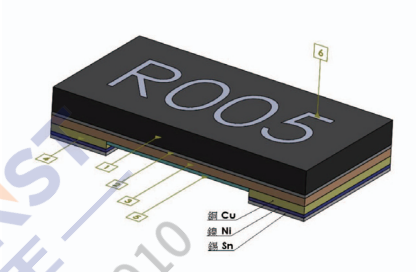
— Computer
— Power supply
— Measuring instrument
— Industrial
— Battery management system

Features

— Low Resistance / TCR / EMF(Only for MnCu) / Inductance
— Excellent long term stability
— RoHs compliant and halogen free.
— down size to 0201.
— High precision current sensing and voltage division.
— High current jumper

Product structure

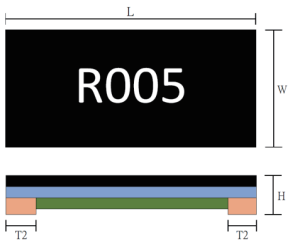
(1) - Substrate : epoxy
(2) - Adhesive : epoxy
(3) - Resistive element : Cu – alloy
(4) - Terminal electrode : Sn、Ni、Cu
(5) - Protective coating
(6) - Marking coating



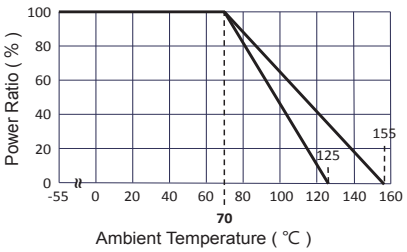
Parts number explanation:

MRE	1206	10	F	R002	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	0201 0402 0603 0805 1206	02=0.20W X2=0.25W 03=0.33W 05=0.50W 10=1.00W Jumper Y6 (for 0201) 01 (for 0603) 02 (for 0402) 0A (for 0805) 03 (for 1206)	F：±1% *J：±5% (*for Jumper)	2M50=2.5mR R005=5.0mR R020=20mR *R000=Jumper	M：MnCu *C：Cu (*for Jumper)	

Type Dimension



DERATING CURVE



The Operating Temperature Range: -55°C ~+155°C(0402~1206). -55°C ~+125°C(0201)
For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below

Standard Electrical Dimension

Unit：mm

	Power Rating	Resistance Range	L	W	H	T2
MRE0201	0.2W	10mΩ,20mΩ	0.60±0.15	0.30±0.15	0.25±0.10	0.15±0.10
MRE0402	0.33W	2.5mΩ,3mΩ	1.00±0.15	0.55±0.15	0.30±0.10	0.30±0.10
		5~25mΩ				0.23±0.10
	0.25W	26~50mΩ				
MRE0603	0.33W	2mΩ	1.60±0.25	0.80±0.25	0.40±0.25	0.45±0.20
		2.5mΩ,3mΩ				0.35±0.20
		4~20mΩ				0.30±0.20
MRE0805	0.5W	1.5mΩ	2.00±0.25	1.25±0.25	0.40±0.25	0.70±0.20
		2mΩ				0.60±0.20
		3~20mΩ				0.40±0.20
MRE1206	1W	1mΩ	3.20±0.25	1.60±0.25	0.40±0.25	1.25±0.30
		2mΩ				1.05±0.30
		3mΩ				0.80±0.30
		4~20mΩ				0.60±0.30

Jumper Dimension

Unit：mm

	Max Resistance	L	W	H	T2
MRE0201	1.0mΩ	0.60±0.15	0.30±0.15	0.25±0.10	0.15±0.10
MRE0402	0.5mΩ	1.00±0.20	0.50±0.20	0.35±0.20	0.20±0.15
MRE0603	0.2mΩ	1.60±0.25	0.80±0.25	0.35±0.25	0.35±0.20
MRE0805	0.2mΩ	2.00±0.25	1.25±0.25	0.35±0.25	0.35±0.20
MRE1206	0.2mΩ	3.20±0.25	1.60±0.25	0.50±0.25	0.50±0.20

Standard Electrical Specifications

Type	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)	Material	Operating Temperature Range (℃)
					1.0% (F)		
MRE0201	0.2W	±200	4.47A	7.07A	10 & 20	MnCu	- 55 ~ + 125
MRE0402	0.33W	±150	11.48A	18.16A	2.5,3	MnCu	- 55 ~ + 155
		±100	8.12A	12.84A	5~25		
	0.25W	±100	3.10A	4.90A	26~50		
MRE0603	0.33W	±150	12.84A	20.31A	2		
		±100	11.49A	18.16A	2.5~5		
		±75	7.41A	11.72A	6~20		
MRE0805	0.5W	±100	18.25A	28.86A	1.5		
		±75	15.81A	25.00A	2~5		
		±50	9.12A	14.43A	6~20		
MRE1206	1W	±75	31.62A	50A	1~4		
		±50	14.14A	22.36A	5~20		

Jumper Specifications

Type	Max. Rating Current	Max. Overload Current	Max Resistance (mΩ)
MRE0201	8A	12A	1
MRE0402	20A	31.62A	0.5
MRE0603	26A	41.07A	0.2
MRE0805	35A	55.33A	0.2
MRE1206	40A	64.22A	0.2

- **Operating Temperature Range (℃) :** - 55 ~ + 155

Reliability Test and Requirement

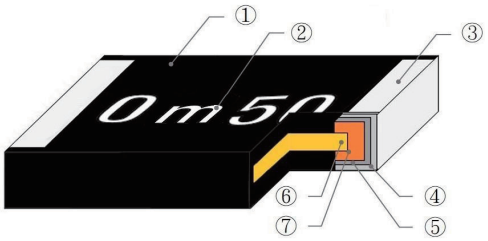
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25℃ /+125℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: 2.5 times of rated power for 5 seconds.	±1.0%+0.5mΩ
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155℃ for 1000 hours.(0402~1206) At 125℃ for 1000 hours.(0201)	±1.0%+0.5mΩ Jumper : < Rmax
Low Temperature Storage	JIS-C-5201-1 4.23.4 IEC60115-1 4.23.4	At -55℃ for 1000 hours	±1.0%+0.5mΩ Jumper : < Rmax
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	±1.0%+0.5mΩ Jumper : < Rmax
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	±2.0%+0.5mΩ Jumper : < Rmax
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,100 cycles(0402~1206) -55℃ to +125℃,100 cycles(0201)	±1.0%+0.5mΩ Jumper : < Rmax
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2 ℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	±2.0%+0.5mΩ Jumper : < Rmax
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	The covered area >95%
Mechanical Shock	JIS-C-5202 6.7	a =50G , t =11ms, 5 times shock	±1.0%+0.5mΩ
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once 2mm for 10 seconds	±1.0%+0.5mΩ

Metal Plate Ultra Low Resistance Chip Resistor

MU Series

■ Application

— Entertainment equipment
— Power Supply
— Measuring instrument
— Industrial equipment
— Battery management system



1	Protective Layer	5	Ni Plating
2	Marking	6	Metal Plate
3	Terminal	7	Cu Plating
4	Sn Plating		

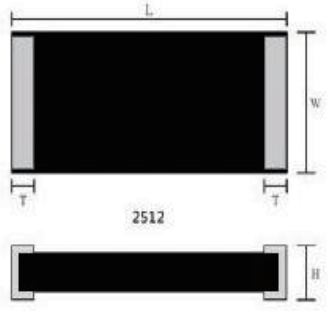
■ Features

— Low Resistance(down to 0.3mR)
Low TCR(down to 50ppm)
Ultra Low TCR(down to 30ppm)
Low Inductance(≦5nH)
— Excellent long term stability
— RoHs compliant and halogen & Lead free.
— High precision current sensing and voltage division.
— AEC-Q200 Compliant

■ Parts Number Explanation

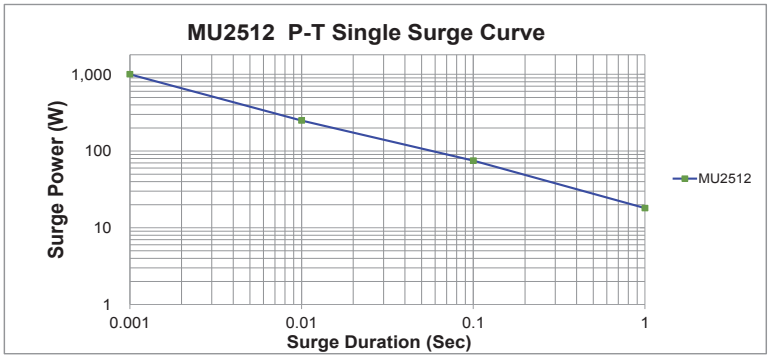
MU	2512	20	F	R001	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	2512	20=2.00W 30=3.00W	D：± 0.5% F：± 1% G：± 2% J：± 5%	0m30= 0.3 mR R002= 2.0 mR	M：MnCu	Z：Default code U：Ultra Low TCR

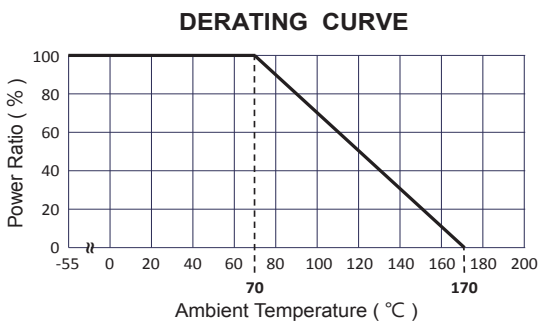
■ Type Dimension



Unit：mm

Series Size	Power Rating	R sistance Range	L	W	H	T
MU2512	2W	0.3mΩ	6.35±0.254	3.10±0.254	1.25±0.254	2.55±0.254
		0.5mΩ			1.25±0.254	1.70±0.254
		1mΩ			0.65±0.254	1.40±0.254
		2mΩ			0.35±0.254	1.40±0.254
	3W	0.3mΩ			1.25±0.254	2.55±0.254
		0.5mΩ			1.25±0.254	1.70±0.254
		1mΩ			0.65±0.254	1.40±0.254
		2mΩ			0.35±0.254	1.40±0.254





Standard Electrical Specifications

Type	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)		Material	Operating Temperature Range (℃)
					0.5%(D)	1.0% (F) 2.0% (G) 5.0% (J)		
MU2512	2W	≦±150	81.65A	182.57A		0.3	0.3mR~2mR:MnCu	- 55 ~ + 170
		≦±75	63.24A	141.42A		0.5		
		≦±50	44.72A	100A	1~2	1~2		
	3W	≦±150	100A	223.6A		0.3	0.3mR~2mR:MnCu	
		≦±75	77.46A	173.20A		0.5		
		≦±50	54.77A	122.47A	1~2	1~2		

Ultra Low TCR Electrical Specifications

Type	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)		Material	Operating Temperature Range (℃)
					0.5%(D)	1.0% (F) 2.0% (G) 5.0% (J)		
MU2512	2W	≦±100	81.65A	182.57A		0.3	0.3mR~2mR:MnCu	- 55 ~ + 170
		≦±50	63.24A	141.42A		0.5		
		≦±30	44.72A	100A	1~2	1~2		
	3W	≦±100	100A	223.6A		0.3	0.3mR~2mR:MnCu	
		≦±50	77.46A	173.20A		0.5		
		≦±30	54.77A	122.47A	1~2	1~2		

Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C /+125°C, 25°C is the reference temperature	Refer to Ratings
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: ● MU2512-2W: 5 times of rated power ● MU2512-3W: 5 times of rated power for 5 seconds.	ΔR/R1≦±1.0%
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 170°C for 1000 hours.	ΔR/R1≦±1.0%
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	ΔR/R1≦±1.0%
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±1.0%
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	ΔR/R1≦±1.0%
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% coverage
Moisture Resistance	MIL-STD 202 Method 106	T=24 hours / Cycle ,10Cycles . Steps 7a& 7b not required. Unpowered . (Figure 1)	ΔR/R1≦± 0.5%

Metal Foil Chip Resistor

MFR Series

Application

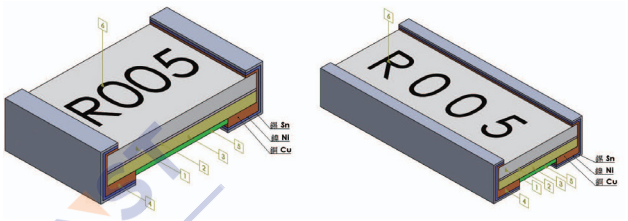
— Entertainment
— Power supply
— Measuring instrument
— Industrial
— Battery management system

Features

— Low Resistance / TCR / EMF (only for MnCu)/Inductance
— Excellent long term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.

Product structure:

(1) - Substrate : Alumina Ceramic
(2) - Adhesive : Epoxy
(3) - Resistive element : Cu – alloy
(4) - Terminal electrode : Sn、Ni、Cu
(5) - Protective coating :
(6) - Marking coating :

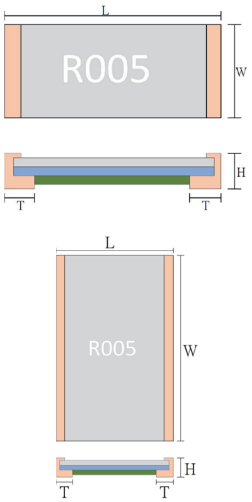


Parts Number Explanation

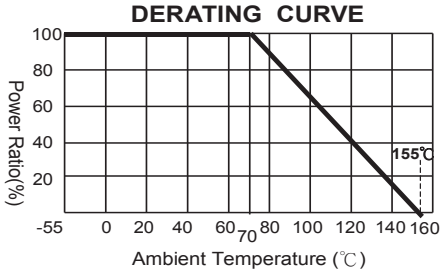
MFR	2512	20	F	R005	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	0603 0805 1206 2010 2512 3921 4527 0508 0612 0815 1225 2139	05=0.50W 07=0.75W 10=1.00W 15=1.50W 20=2.00W 30=3.00W 40=4.00W 50=5.00W	D : ± 0.5% F : ± 1.0% G : ± 2.0%	2M50=2.5mR R005=5.0mR R020=020mR R150=150mR	M : MnCu C : Cu Alloy	

Type Dimension

Unit: mm



	Power Rating	Resistance Range	L	W	H	T
MFR0603	0.5W	5mΩ	1.60±0.25	0.80±0.25	0.65±0.20	0.50±0.20
		6~100mΩ				0.40±0.20
MFR0805	0.75W	4~270mΩ	2.00±0.25	1.20±0.25	0.65±0.20	0.50±0.20
MFR1206	1W	4~700mΩ	3.20±0.25	1.60±0.25	0.65±0.20	0.68±0.30
MFR2010	1.5W	2~3mΩ	5.08±0.25	2.54±0.25	0.65±0.20	2.10±0.30
		4~500mΩ				0.70±0.30
MFR2512	2W	2mΩ	6.40±0.30	3.20±0.30	0.75±0.20	1.65±0.30
		3mΩ			0.75±0.20	1.65±0.30
		4~560mΩ			0.65±0.20	1.05±0.30
MFR3921	4W	10~50mΩ	11.10±0.30	5.10±0.30	0.65±0.30	2.36±0.30
MFR4527	5W	10~50mΩ	11.60±1.0	7.10±1.0	0.65±0.30	2.70±0.40
MFR0508	1W	1~100mΩ	1.35±0.20	2.10±0.20	0.65±0.20	0.43±0.20
MFR0612	1.5W	1mΩ	1.60±0.25	3.20±0.25	0.65±0.20	0.50±0.30
		2~100mΩ				0.40±0.20
MFR0815	2W	1~20mΩ	2.20±0.20	3.80±0.20	0.65±0.20	0.61±0.20
MFR1225	3W	1~100mΩ	3.20±0.30	6.40±0.30	0.65±0.20	0.60±0.20
MFR2139	5W	1~100mΩ	5.10±0.40	11.10±0.30	0.65±0.30	0.90±0.30



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ Standard Electrical Specifications

Type	Rating Power at 70℃	T.C.R. (ppm/℃)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)			Material	Operating Temperature Range (℃)
					0.5% (D)	1.0% (F)	2.0%(G)		
MFR0603	0.5W	±75	10A	15.81A	—	5~9	—	R005~R049 : MnCu R050~R100 : Cu Alloy	-55℃~155℃
		±50	7.07A	11.18A	10~100		—		
MFR0805	0.75W	±75	13.69A	21.65A	—	4~9	—	R004~R049 : MnCu R050~R270 : Cu Alloy	
		±50	8.66A	13.69A	10~270		—		
MFR1206	1W	±75	15.81A	25A	—	4~9	—	R004~R049 : MnCu R050~R700 : Cu Alloy	
		±50	10A	15.81A	10~700		—		
MFR2010	1.5W	±100	27.38A	43.30A	—	2~9	—	R002~R500 : Cu Alloy	
		±50	12.24A	19.36A	10~500		—		
MFR2512	2W	±75	31.62A	50A	—	2~9	—	R002~R049 : MnCu R050~R560 : Cu Alloy	
		±50	14.14A	22.36A	10~560		—		
MFR3921	4W	—	—	—	—		—	R010~R050 : Cu Alloy	
		±50	20A	31.62A	10~50		—		
MFR4527	5W	—	—	—	—	—	—	R010~R050 : Cu Alloy	
		±50	22.36A	35.35A	10~50		—		
MFR0508	1W	±100	31.62A	50A	—	—	1	R001~R009 : MnCu R010~R100 : Cu Alloy	
		±100	22.36A	35.35A	—	2~9	—		
		±50	10A	15.81A	10~100		—		
MFR0612	1.5W	±100	38.72A	61.23A	—	—	1	R001~R009 : MnCu R010~R100 : Cu Alloy	
		±100	27.38A	43.30A	—	2~9	—		
		±50	12.24A	19.36A	10~100		—		
MFR0815	2W	±100	44.72A	70.71A	—	—	1	R001~R020 : Cu Alloy	
		±100	31.62A	50A	—	2~9	—		
		±50	14.14A	22.36A	10~20		—		
MFR1225	3W	±100	54.77A	86.60A	—	1~9	—	R001~R020 : MnCu R021~R100 : Cu Alloy	
		±50	17.32A	27.38A	10~100		—		
MFR2139	5W	±100	70.71A	111.8A	—	1~9	—	R001~R020 : MnCu R021~R100 : Cu Alloy	
		±50	22.36A	35.35A	10~100		—		

■ Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25℃ /+125℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: 2.5 times of rated power for 5 seconds.	±1.0%+0.5mΩ
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155℃ for 1000 hours.	±1.0%+0.5mΩ
Low Temperature Storage	JIS-C-5201-1 4.23.4 IEC60115-1 4.23.4	At -55℃ for 1000 hours	±1.0%+0.5mΩ
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	±1.0%+0.5mΩ
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	±2.0%+0.5mΩ
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,100 cycles	±1.0%+0.5mΩ
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2 ℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs 〝ON〞 and 0.5 hr 〝OFF〞.	±2.0%+0.5mΩ
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	The covered area >95%
Mechanical Shock	JIS-C-5202 6.7	a =50G , t =11ms, 5 times shock	±1.0%+0.5mΩ
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once 2mm for 10 seconds	±1.0%+0.5mΩ

Metal Foil Four Terminal Chip Resistor

MFF Series

Application

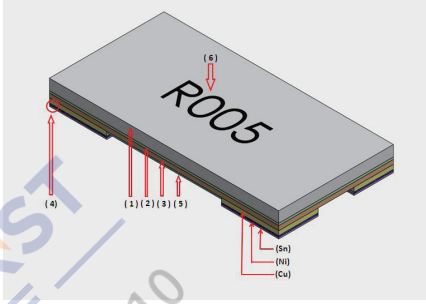
— Entertainment
— Power supply
— Measuring instrument
— Industrial
— Battery management system

Features

— Low Resistance / TCR / EMF / Inductance
— Excellent long term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.

Product structure:

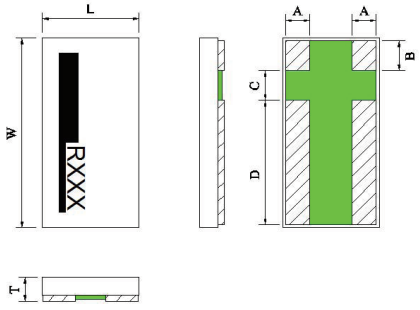
(1) - Substrate : Alumina Ceramic
(2) - Adhesive : Epoxy
(3) - Resistive element : MnCu – alloy
(4) - Terminal electrode : Cu、Ni、Sn
(5) - Protective coating
(6) - Marking coating :



Parts Number Explanation

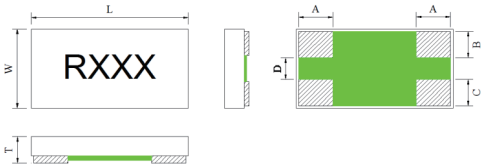
MFF	1225	20	F	R001	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	0306 0612 1225 2139 1206 2512 3921	03=0.33W 05=0.50W 10=1.00W 15=1.50W 20=2.00W 40=4.00W	C : ± 0.3% D : ± 0.5% F : ± 1.0%	0M50=0.50mR R001=1.0mR R025=25mR R100=100mR	M: MnCu S: CuMn7Sn	

Type Dimension



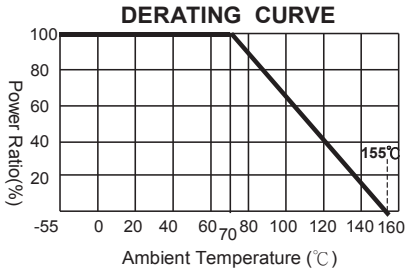
Unit : mm

	Power Rating	Resistance Range	W	L	A	B	C	D	T
MFF0306	0.33W	1~25mΩ	1.60±0.20	0.80±0.15	0.18±0.10	0.23±0.10	0.40±0.10	0.93±0.20	0.55±0.10
MFF0612	1W	0.5~25mΩ	3.20±0.20	1.60±0.20	0.41±0.20	0.46±0.20	0.50±0.20	2.16±0.20	0.50±0.20
MFF1225	2W	1~25mΩ	6.30±0.20	3.10±0.20	0.50±0.20	0.62±0.20	0.50±0.20	5.12±0.20	0.60±0.20
MFF2139	4W	1~25mΩ	11.0±0.30	5.00±0.30	0.70±0.20	1.40±0.20	1.05±0.20	8.50±0.30	0.60±0.20



Unit : mm

	Power Rating	Resistance Range	W	L	A	B	C	D	T
MFF1206	0.5W	5~100mΩ	1.60±0.20	3.20±0.20	0.60±0.20	0.55±0.20	0.55±0.20	0.50±0.20	0.60±0.20
MFF2512	1W	3~100mΩ	3.10±0.20	6.30±0.20	0.95±0.20	1.05±0.20	1.05±0.20	1.00±0.20	0.60±0.20
MFF3921	1.5W 2W	3~5mΩ	5.00±0.30	11.0±0.30	2.00±0.30	1.70±0.20	1.70±0.20	1.50±0.20	0.80±0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Type	Rating Power at 70℃	T.C.R. (ppm/°C) (20-60°C)	T.C.R. (ppm/°C) (25-125°C)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)			Material	Operating Temperature Range (℃)
						0.3% (C)	0.5% (D)	1.0% (F)		
MFF0306	0.33W	—	±100	18.16A	28.72A	—		1~4	MnCu	-55℃~155℃
		—	±50	8.12A	12.84A	—		5~25		
MFF0612	1W	—	±150	44.72A	70.71A	—		0.5~0.75		
		—	±100	31.62A	50A	—		1~4		
		—	±50	14.14A	22.36A	—	5~25			
MFF1225	2W	—	±100	44.72A	70.71A	—		1~4		
		—	±50	20A	31.62A	—	5~25			
MFF2139	4W	—	±100	63.24A	100A	—		1~4		
		—	±50	28.28A	44.72A	—	5~25			
MFF1206	0.5W	—	±50	10.00A	15.81A	—	5~9			
		—	±30	7.07A	11.18A	10~100		—		
MFF2512	1W	—	±50	18.26A	28.87A	—	3~4			
MFF2512	1W	—	±30	14.14A	22.36A	—	5~100			
MFF3921	1.5W	±30	—	22.36A	35.35A	3		—	CuMn7Sn	
MFF3921	2W	±20	—	22.36A	35.35A	4~5		—		

Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C /+125°C, 25°C is the reference temperature At 20°C /+60°C, 20°C is the reference temperature	Refer to Ratings
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: 2.5 times of rated power for 5 seconds.	±1.0%+0.5mΩ
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155℃ for 1000 hours.	±1.0%+0.5mΩ
Low Temperature Storage	JIS-C-5201-1 4.23.4 IEC60115-1 4.23.4	At -55℃ for 1000 hours	±1.0%+0.5mΩ
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	±1.0%+0.5mΩ
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	±2.0%+0.5mΩ
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,100 cycles	±1.0%+0.5mΩ
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2 ℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	±2.0%+0.5mΩ
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	The covered area >95%
Mechanical Shock	JIS-C-5202 6.7	a =50G , t =11ms, 5 times shock	±1.0%+0.5mΩ
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once 2mm for 10 seconds	±1.0%+0.5mΩ

Metal Shunt Chip Resistor

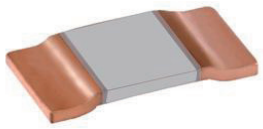
SR Series

■ Application

— Power modules
— High current Power Supply
— Motor Driver
— Industrial
— Battery management system
— Automotive

■ Features

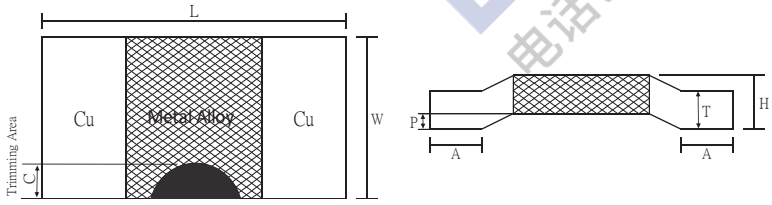
— Low Resistance / TCR
— Excellent long-term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.
— Excellent Anti-Surge ability .
— AEC-Q200 compliant



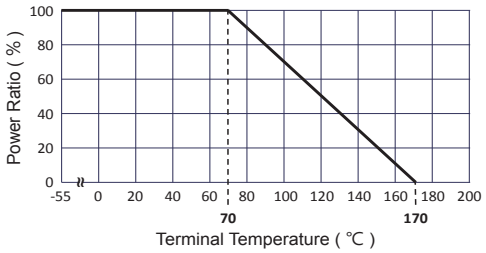
■ Parts Number Explanation

SR	2512	20	F	R004	M	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	1206 2512 3920 5930	20=2.00W 25=2.50W 30=3.00W 50=5.00W .. .. T0=10.0W T2=12.0W	F : ±1% G : ±2% J : ±5%	0m50=0.5mR R001=1.0mR R005=5mR	S : MnCuSn M : MnCu F : FeCrAl R : NiCrAl	

■ Type Dimension



Power Derating Curve



■ Dimension

Unit：mm

TYPE	Resistance	L	W	H	T	A	C（Max.）	p	Material
SR1206	0.3mR	3.2±0.3	1.65±0.3	1.20±0.15	-	0.80±0.2	-	-	MnCuSn
	0.5mR/1mR	3.2±0.3	1.65±0.3	0.90±0.15	-	0.80±0.2	-	-	MnCuSn/ MnCu
SR2512	0.25mR	6.5±0.3	3.25±0.3	1.35±0.15	1.00±0.15	0.90±0.2	0.4	0.35±0.1	MnCuSn
	0.3mR			1.17±0.15	0.82±0.15				MnCuSn
	0.5mR			1.07±0.15	0.72±0.15				MnCu
	0.75mR			0.95±0.15	0.6±0.15				MnCu
	1mR			0.73±0.15	0.38±0.15				MnCu
	2mR			0.96±0.15	0.61±0.15				FeCrAl
	3mR			0.76±0.15	0.41±0.15				FeCrAl
	4mR			0.66±0.15	0.31±0.15				FeCrAl/NiCrAl
	5mR			0.66±0.15	0.31±0.15				FeCrAl
SR3920	0.2mR	10.2±0.30	5.20±0.3	1.98±0.15	1.48±0.15	1.8±0.3	0.6	0.50±0.1	MnCuSn
	0.3mR			1.92±0.15	1.42±0.15				MnCu
	0.5mR			1.36±0.15	0.86±0.15				MnCu
	1mR			0.92±0.15	0.42±0.15				MnCu
	1mR			1.87±0.15	1.37±0.15				FeCrAl
	1.5mR			1.46±0.15	0.96±0.15				FeCrAl
	2mR			1.19±0.15	0.69±0.15				FeCrAl
	3mR			0.94±0.15	0.44±0.15				FeCrAl
	4mR			0.85±0.15	0.35±0.15				FeCrAl
	5mR			0.85±0.15	0.35±0.15				FeCrAl
SR5930	0.2mR	15±0.3	7.75±0.3	1.92±0.15	1.42±0.15	4.2±0.2	1.0	0.50±0.1	MnCu
	0.3mR			1.44±0.15	0.94±0.15				MnCu
	0.5mR			1.08±0.15	0.58±0.15				MnCu
	1mR			1.37±0.15	0.87±0.15				FeCrAl
	2mR			0.95±0.15	0.46±0.15				FeCrAl
	3mR			0.90±0.15	0.40±0.15				FeCrAl

Standard Electrical Specifications

Type	Power Rating at 70℃	T.C.R. (ppm/℃)	Max. Rating Current(A)	Max. Overload Current(A)	Resistance Range (mΩ) 1.0% (F) 2.0% (G) 5.0% (J)	Material	Operating Temperature Range (℃)
SR1206	2W	≦±300	81.6	182.57	0.3	MnCuSn	- 65 ~ + 170
	2W	≦±200	63.24	141.42	0.5	MnCuSn	
	2W	≦±150	44.72	100	1	MnCu	
SR2512	6W	≦±200	154.92	346.41	0.25	MnCuSn	
	6W	≦±150	141.42	316.22	0.3	MnCuSn	
	6W	≦±115	109.54	244.94	0.5	MnCu	
	5W	≦±115	81.65	182.57	0.75	MnCu	
	5W	≦±100	70.71	158.11	1	MnCu	
	5W	≦±50	50	111.80	2	FeCrAl	
	4W	≦±50	36.51	81.65	3	FeCrAl	
	3W	≦±50	27.38	61.23	4	FeCrAl	
	3W	≦±50	27.38	61.23	4	NiCrAl	
	2.5W	≦±50	22.36	50	5	FeCrAl	
SR3920	12W	≦±200	244.94	547.72	0.2	MnCuSn	
	10W	≦±150	182.57	408.24	0.3	MnCu	
	9W	≦±75	134.16	300	0.5	MnCu	
	8W	≦±50	89.44	200	1	FeCrAl	
	7W	≦±50	83.66	187.08	1	MnCu	
	7W	≦±50	68.31	152.75	1.5	FeCrAl	
	6W	≦±50	54.77	122.47	2	FeCrAl	
	5W	≦±50	40.82	91.28	3	FeCrAl	
	4W	≦±50	31.62	70.71	4	FeCrAl	
	3W	≦±50	24.49	54.77	5	FeCrAl	
SR5930	15W	≦±100	273.86	612.37	0.2	MnCu	
	10W	≦±100	182.57	408.24	0.3	MnCu	
	8W	≦±75	126.49	282.84	0.5	MnCu	
	8W	≦±50	89.44	200	1	FeCrAl	
	7W	≦±50	59.16	132.28	2	FeCrAl	
	5W	≦±50	40.82	91.28	3	FeCrAl	

- For non-standard parts, please contact our sales dept.
- Power rating is guaranteed when terminal temperature of resistor is below 70℃

Reliability Test and Requirement

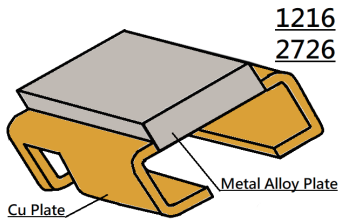
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C /+125°C, 25°C is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: ● SR1206: 5 times of rated power ● SR2512: 5 times of rated power ● SR3920: 5 times of rated power ● SR5930: 5 times of rated power for 5 seconds.	ΔR/R1≦±(1.0%+0.0005Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=170°C. Unpowered. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±(1.0%+0.0005Ω)
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	ΔR/R1≦±(1.0%+0.0005Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±(1.0%+0.0005Ω)
Operation Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±(1.0%+0.0005Ω)
Moisture Resistance	MIL-STD-202, Method 106	Humidity of 90~98% and a temperature of 25°C / 65°C ,10 cycles	ΔR/R1≦±(1.0%+0.0005Ω)
Solderability	J-STD-002	(1) 4 hrs 155°C dry heat (2) 245±5°C 3 sec.	>95% coverage(electrode area)

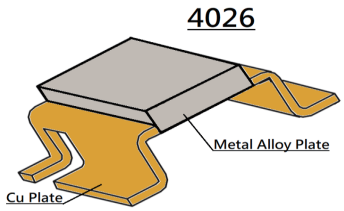
● Note : All Reliability test should follow De-rating curve , terminal temperature of component should be below 70℃.

● Note : Footprint size, solder insufficient, excessive solder, solder void and component shifted will affect the resistance accuracy after IR reflow. Circuit calibration is a must to be done by functional test.

Metal Shunt Four Terminal Chip Resistor

SRF Series





■ Application

— High current Power modules
— High current Power Supply
— Motor Driver
— Industrial control
— Battery management system

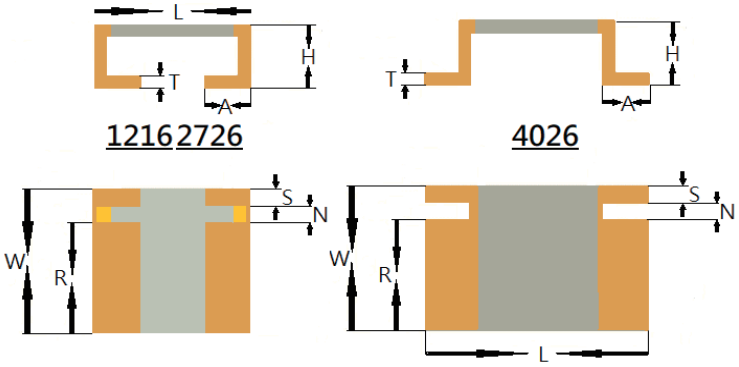
■ Features

— Low Resistance / TCR
— Excellent long-term stability
— RoHs compliant and halogen free.
— Lead free.
— High precision current sensing and voltage division.
— Excellent Anti-Surge ability .
— Four terminal construction.(Down size to 1216)
— AEC-Q200 compliant

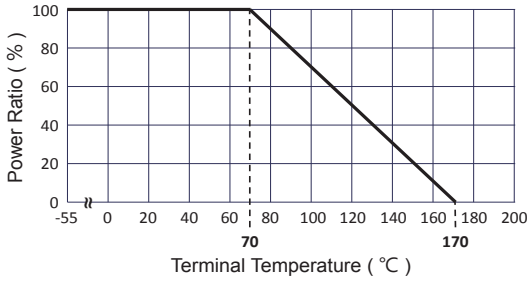
■ Parts Number Explanation

SRF	2726	30	F	R004	F	Z
Product Type	Size (Inch)	Rated Power	Tolerance	Resistance	Material	Optional
	1216 2726 4026	30=3.00W 40=4.00W 50=5.00W 60=6.00W 70=7.00W	F：±1% G：±2% J：±5%	0m50=0.5mR R001=1.0mR R005=5mR	S ：MnCuSn M：MnCu F：FeCrAl	

■ Type Dimension



Power Derating Curve



Unit：mm

TYPE	Resistance	L	W	H	T	A	S	N	R
SRF1216	0.5mR	3.0±0.30	3.81±0.30	1.80(Ref)	0.30±0.20	1.3±0.30	0.50(Ref.)	0.60(Ref.)	2.7(Ref.)
	1mR	3.0±0.30	3.81±0.30	1.80(Ref)	0.30±0.20	1.3±0.30	0.50(Ref.)	0.60(Ref.)	2.7(Ref.)
SRF2726	0.5mR	6.9±0.30	6.6±0.30	2.85(Ref)	0.45±0.20	1.9±0.30	0.70(Ref.)	1.0(Ref.)	5.0(Ref.)
	1mR			2.85(Ref)	0.37±0.20				5.0(Ref.)
	2mR			2.85(Ref)	0.55±0.20				5.0(Ref.)
	3mR			2.85(Ref)	0.37±0.20				5.0(Ref.)
	4mR			2.85(Ref)	0.37±0.20				5.0(Ref.)
	5mR			2.85(Ref)	0.37±0.20				5.0(Ref.)
SRF4026	0.2mR	10.1±0.30	6.6±0.30	2.85(Ref)	0.40±0.20	1.9±0.30	0.70(Ref.)	1.0(Ref.)	5.0(Ref.)
	0.5mR			2.85(Ref)	0.45±0.20				
	1mR			2.85(Ref)	0.37±0.20				
	3mR			2.85(Ref)	0.37±0.20				

Standard Electrical Specifications

Type	Power Rating at 70℃	T.C.R. (ppm/℃)	Max. Rating Current(A)	Max. Overload Current(A)	Resistance Range (mΩ) 1.0% (F) 2.0% (G) 5.0% (J)	Material	Operating Temperature Range (℃)
SRF1216	5W	≦±50	100.00	223.60	0.5	MnCuSn	- 65 ~ + 170
	3W	≦±50	54.77	122.47	1	MnCu	
SRF2726	7W	≦±50	118.31	264.58	0.5	MnCuSn	
	6W	≦±50	77.46	173.21	1	MnCu	
	6W	≦±50	54.77	122.47	2	FeCrAl	
	4W	≦±50	36.51	81.64	3	FeCrAl	
	3W	≦±50	27.39	61.24	4	FeCrAl	
	3W	≦±50	24.49	54.77	5	FeCrAl	
SRF4026	7W	≦±50	187.08	418.33	0.2	MnCuSn	
	7W	≦±50	118.32	264.58	0.5	MnCuSn	
	6W	≦±50	77.46	173.21	1	MnCu	
	4W	≦±50	36.51	81.64	3	FeCrAl	

- For non-standard parts, please contact our sales dept.
- Power rating is guaranteed when terminal temperature of resistor is below 70℃

Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C /+125°C, 25°C is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: • SRF1216: 5 times of rated power • SRF2726: 5 times of rated power • SRF4026: 5 times of rated power for 5 seconds.	ΔR/R1≦±(1.0%+0.0005Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=170°C. Unpowered. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±(1.0%+0.0005Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±(1.0%+0.0005Ω)
Operation Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.	ΔR/R1≦±(1.0%+0.0005Ω)
Moisture Resistance	MIL-STD-202, Method 106	Humidity of 90~98% and a temperature of 25°C / 65°C ,10 cycles	ΔR/R1≦±(1.0%+0.0005Ω)
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	ΔR/R1≦±(1.0%+0.0005Ω)
Solderability	J-STD-002	(1) 4 hrs 155°C dry heat (2) 245±5°C 3 sec.	>95% coverage(electrode area)

- Note: All Reliability test should follow De-rating curve , terminal temperature of component should be below 70℃.
- Note : Footprint size, solder insufficient, excessive solder, solder void and component shifted will affect the resistance accuracy after IR reflow. Circuit calibration is a must to be done by functional test.

Automotive Chip Resistor

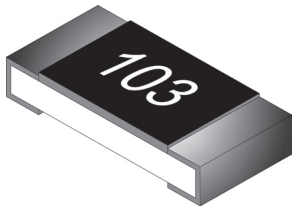
QR Series

■ Application

— Automotive electronics
— Navigation equipment,TPMS
— Heating, Ventilating and Air conditioning
— Indoor lighting, Central door locking, Wiper module

■ Features

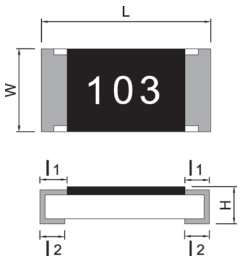
— Small size and light weight
— Reliability, high quality
— CCD visual quality inspection
— AEC-Q200 Compliant



■ Parts Number Explanation

QR	0603	J	10R0	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
QR	0402 0603 0805 1206 1210 1812 2010 2512	B：± 0.1% D：± 0.5% F：± 1% G：± 2% J：± 5%	0R=0R00 10mR=R010 100mR=R100 1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (0603~1210) Q：Paper Taping (0402) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS 40：40000PCS 50：50000PCS	Z：Default code

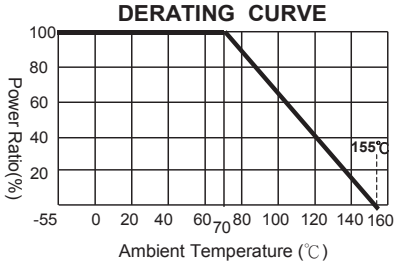
■ Type Dimension



Unit：mm

TYPE	L	W	H	I_1	I_2
QR0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
QR0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
QR0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
QR1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
QR1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
QR1812	4.50 ± 0.10	3.10 ± 0.15	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
QR2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
QR2512	6.30 ± 0.20	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20

DERATING CURVE



■ Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range B(±0.1%) D(±0.5%)	Resistance Range F(±1%) G±(2%)	Resistance Range J(±5%) K(±10%)
QR0402	0.063 W	50V	100V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QR0603	0.1 W	75V	150V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QR0805	0.125 W	150V	300V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QR1206	0.25 W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QR1210	0.5 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QR1812	0.75 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QR2010	0.75 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QR2512	1 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃

Type	0402	0603	0805	1206	1210	1812	2010	2512
Jumper Resistance Value	50mΩMax							
Jumper Rated Current	1A			2A				

Low-Resistance Specifications

Item / Type	Rated Power at 70℃	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (mΩ) F(±1%)、J±(5%)
QR0402	0.063 W	0.12~0.25V	0.624 V	±1000	220≦R≦450
				±800	450<R<1000
QR0603	0.1 W	0.09~0.31V	0.775 V	±1000	75≦R<100
				±800	100≦R≦330
				±600	330<R<1000
QR0805	0.125 W	0.04~0.35V	0.875 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QR1206	0.25 W	0.05~0.5V	1.25 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QR1210	0.5 W	0.07~0.7V	1.75 V	±1800	10≦R<50
				±800	50≦R<100
				±600	101≦R<990
QR1812	0.75 W	0.08~0.8V	2.15 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QR2010	0.75 W	0.08~0.8V	2.15 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QR2512	1 W	0.1~0.99V	2.475V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

High-Resistance Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%)	Resistance Range J(±5%)
QR0402	0.063 W	50V	100V	±200	10.1 MΩ ~ 30 MΩ	10.1 MΩ ~ 30 MΩ
QR0603	0.1 W	75V	150V			
QR0805	0.125 W	150V	300V			
QR1206	0.25 W	200V	400V			
QR1210	0.5 W					
QR1812	0.75 W					
QR2010	0.75 W					
QR2512	1 W					

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Reliability Test and Requirement

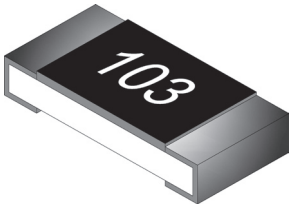
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω) Value <1Ω： ±(2.0%+0.1Ω)
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.10Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion.	1%：±(0.5%+0.05Ω) 5% ：±(2.0%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power.Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	—
Mechanical Shock	MIL-STD-202 Method 213	Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. 6 shocks in each direction, total 18 shocks.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
ESD	AEC-Q200- 002 or ISO/DIS 10605	Human body model 0402 / 0603：1KV 0805 and above：2KV	±(3%+0.05Ω)
Solderability	J-STD-002	(1) 4 hrs 155℃ dry heat (2) 245±5℃ 3 sec.	±1：±(0.5%+0.05Ω) ±5：±(1.0%+0.05Ω)
Terminal Strength (SMD)	AEC-Q200-006	Pressurizing force for 60 seconds 0402 / 0603：8N ; 0805 and above：17.7N	No broken

Automotive High Power Chip Resistor

QRH Series

■ Application

— Automotive electronics
— Navigation equipment,TPMS
— Heating, Ventilating and Air conditioning
— Indoor lighting, Central door locking, Wiper module



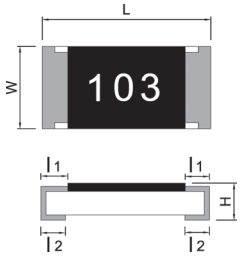
■ Features

— Small size and light weight
— Reliability, high quality
— CCD visual quality inspection
— AEC-Q200 Compliant

■ Parts Number Explanation

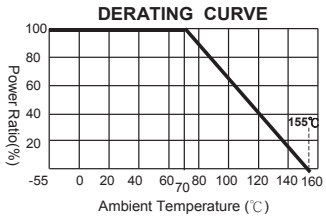
QRH	0603	J	10R0	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
QRH	0402 0603 0805 1206 1210 1812 2010 2512	F：±1% J：±5%	0R=0R00 10mR=R010 100mR=R100 1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (0603~1210) Q：Paper Taping (0402) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS 40：40000PCS 50：50000PCS	Z：Default code

■ Type Dimension



Unit：mm

TYPE	L	W	H	I_1	I_2
QRH0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
QRH0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
QRH0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
QRH1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
QRH1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
QRH1812	4.50 ± 0.10	3.10 ± 0.15	0.55 ± 0.05	0.55 ± 0.20	0.70 ± 0.20
QRH2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
QRH2512	6.30 ± 0.20	3.20 ± 0.15	0.65 ± 0.15	0.60 ± 0.20	0.60 ± 0.20



■ High Power Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%)	Resistance Range J(±5%)
QRH0402	0.1W	50V	100V	±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRH0603	0.125 W	75V	150V	±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRH0805	0.25 W	150V	300V	±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRH1206	0.5 W	200V	400V	±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRH1210	0.66 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRH1812	1 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRH2010	1 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRH2512	2 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Type	0402	0603	0805	1206	1210	1812	2010	2512
Jumper Resistance Value	20mΩMax							
Jumper Rated Current	2A	2.5A	3.5A	5A	6A	7A	7A	10A
Max. Over Load Current <1 second and 1 times	6A	9A	13A	16A	19A	22A	22A	30A

Low-Resistance Specifications

Item / Type	Rated Power at 70℃	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (mΩ) F(±1%)、J±(5%)
QRH0402	0.1W	0.15~0.31V	0.786V	±1000	220≦R≦450
				±800	450<R<1000
QRH0603	0.125W	0.1~0.35V	0.879V	±1000	75≦R<100
				±800	100≦R≦330
				±600	330<R<1000
QRH0805	0.25W	0.05~0.5V	1.244V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRH1206	0.5W	0.07~0.7V	1.759V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRH1210	0.66W	0.08~0.81V	2.021V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRH1812	1W	0.1~0.99V	2.487V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRH2010	1W	0.1~0.99V	2.487V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRH2512	2W	0.14~1.41V	3.518V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

High-Resistance Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resista e Range F(±1%)	Resista e Range J(±5%)
QRH0402	0.1W	50V	100V	±200	10.1 MΩ ~ 30 MΩ	10.1 MΩ ~ 30 MΩ
QRH0603	0.125 W	75V	150V			
QRH0805	0.25 W	150V	300V			
QRH1206	0.5 W	200V	400V			
QRH1210	0.66 W					
QRH2010	1 W					
QRH2512	2 W					

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Reliability Test and Requirement

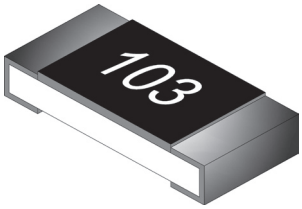
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	High Power：2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω) Value <1Ω： ±(2.0%+0.1Ω)
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.10Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion.	1%：±(0.5%+0.05Ω) 5% ：±(2.0%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power.Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	—
Mechanical Shock	MIL-STD-202 Method 213	Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. 6 shocks in each direction, total 18 shocks.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
ESD	AEC-Q200- 002 or ISO/DIS 10605	Human body model 0402 / 0603：1KV 0805 and above：2KV	±(3%+0.05Ω)
Solderability	J-STD-002	(1) 4 hrs 15℃ dry heat (2) 245±5℃ 3 sec.	±1：±(0.5%+0.05Ω) ±5：±(1.0%+0.05Ω)
Terminal Strength (SMD)	AEC-Q200-006	Pressurizing force for 60 seconds 0402 / 0603：8N ; 0805 and above：17.7N	No broken

Automotive Ultra High Power Chip Resistor

QUH Series

■ Application

— Automotive electronics
— Navigation equipment,TPMS
— Heating, Ventilating and Air conditioning
— Indoor lighting, Central door locking, Wiper module



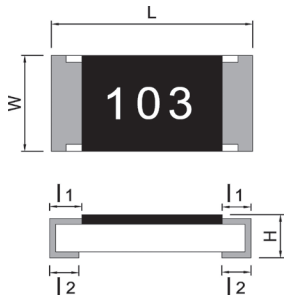
■ Features

— Small size and light weight
— Reliability, high quality
— CCD visual quality inspection
— AEC-Q200 Compliant

■ Parts Number Explanation

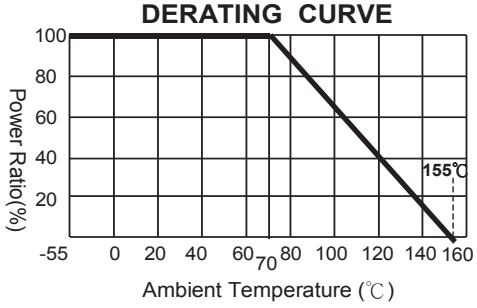
QUH	0603	J	10R0	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
QUH	0402 0603 0805 1206 1210 2010 2512	D：±0.5% F：±1% G：±2% J：±5%	1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (0603~1210) Q：Paper Taping (0402) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS 20：20000PCS 40：40000PCS 50：50000PCS	Z：Ultra High Power

■ Type Dimension



Unit: mm

TYPE	L	W	H	l_1	l_2
QUH0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
QUH0603	1.60 ± 0.10	0.80 ± 0.10	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
QUH0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
QUH1206	3.05 ± 0.10	1.60 ± 0.10	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
QUH1210	3.05 ± 0.10	2.50 ± 0.15	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
QUH2010	5.00 ± 0.20	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
QUH2512	6.30 ± 0.20	3.20 ± 0.15	0.68 ± 0.15	0.60 ± 0.20	0.60 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Ultra High Power Rating Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range		
					D(±0.5%)	F(±1%) G(±2%)	J(±5%)
QUH0402	0.2W	50V	100V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QUH0603	0.33W	150V	200V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QUH0805	0.5W	200V	300V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QUH1206	0.75W	200V	400V	±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QUH1210	1 W			±400	-	1Ω≦R<10Ω	
				±100	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QUH2010	1.5 W			±400	-	1Ω≦R<10Ω	
				±150	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	
QUH2512	3W	250V	500V	±400	-	1Ω≦R<10Ω	
				±150	10Ω≦R≦1MΩ	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Reliability Test and Requirement

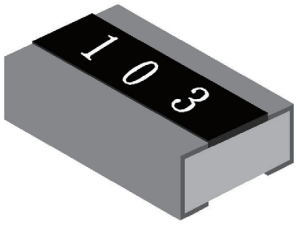
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	Ultra Power : 5 × Rated power or Max Overload Voltage whichever is less for 5 seconds	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.10Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion.	1%：±(0.5%+0.05Ω) 5% ：±(2.0%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power.Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	—
Mechanical Shock	MIL-STD-202 Method 213	Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. 6 shocks in each direction, total 18 shocks.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
ESD	AEC-Q200- 002 or ISO/DIS 10605	Human body model 0402 / 0603：1KV 0805 and above：2KV	±(3%+0.05Ω)
Solderability	J-STD-002	(1) 4 hrs 155℃ dry heat (2) 245±5℃ 3 sec.	±1：±(0.5%+0.05Ω) ±5：±(1.0%+0.05Ω)
Terminal Strength (SMD)	AEC-Q200-006	Pressurizing force for 60 seconds 0402 / 0603：8N ; 0805 and above：17.7N	No broken

Automotive Wide Terminal Chip Resistor

QRW Series

■ Application

— Automotive electronics
— Navigation equipment,TPMS
— Heating, Ventilating and Air conditioning
— Indoor lighting, Central door locking, Wiper module



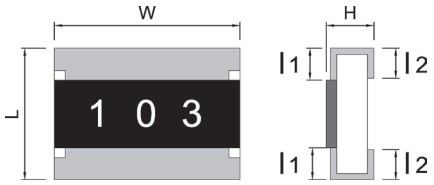
■ Features

— Small size and light weight
— Reliability, high quality
— CCD visual quality inspection
— AEC-Q200 Compliant

■ Parts Number Explanation

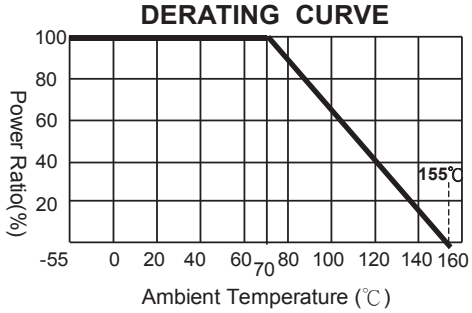
QRW	0612	J	R100	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
QRW	0612 1020 1218 1225 2030	F：±1% J：±5%	10mR=R010 100mR=R100 1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (0612) E：Embossed Taping (1020~2030)	01：1000PCS 04：4000PCS 05：5000PCS	Z：Default

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2
QRW0612	1.60 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.30 ± 0.20	0.50 ± 0.20
QRW1020	2.50 ± 0.20	5.00 ± 0.20	0.55 ± 0.10	0.40 ± 0.20	0.75 ± 0.20
QRW1218	3.10 ± 0.10	4.60 ± 0.10	0.55 ± 0.05	0.40 ± 0.20	0.50 ± 0.20
QRW1225	3.20 ± 0.20	6.50 ± 0.20	0.55 ± 0.20	0.40 ± 0.20	0.75 ± 0.20
QRW2030	5.10 ± 0.10	7.60 ± 0.10	1.20 ± 0.10	0.80 ± 0.20	0.80 ± 0.20



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range	
					F(±1%)	J(±5%)
QRW0612	0.75 W	200V	400V	±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRW1020	1 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRW1218	1 W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRW1225	2W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	
QRW2030	3W			±400	1Ω≦R<10Ω	
				±100	10Ω≦R≦10MΩ	

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～+155℃

■ Low-Resistance Specifications

Item / Type	Rated Power at 70℃	Rated Voltage Range	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range (mΩ)
					F(±1%)、J±(5%)
QRW0612	0.75W	0.087~0.86V	2.154V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRW1020	1W	0.1~0.99V	2.475V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRW1218	1W	0.1~0.99V	2.475V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000
QRW1225	2W	0.14~1.41V	3.518 V	±1800	10≦R<50
				±800	50≦R<100
				±600	100≦R<1000

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～+155℃

■ Reliability Test and Requirement

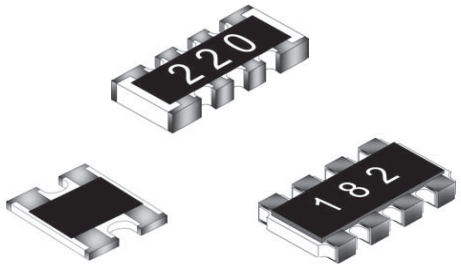
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±1%：±(1.0%+0.05Ω) ±5%：±(2.0%+0.1Ω) Value <1Ω： ±(2.0%+0.1Ω)
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	±1%：±(0.5%+0.05Ω) ±5%：±(1.0%+0.10Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±1%：±(1.0%+0.05Ω) ±5% ：±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion.	±1%：±(0.5%+0.05Ω) ±5% ：±(2.0%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power.Measurement at 24±4 hours after test conclusion.	±1%：±(1.0%+0.05Ω) ±5% ：±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	—
Mechanical Shock	MIL-STD-202 Method 213	Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. 6 shocks in each direction, total18 shocks.	±1%：±(1.0%+0.05Ω) ±5%：±(2.0%+0.1Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz	±1%：±(1.0%+0.05Ω) ±5%：±(2.0%+0.1Ω)
ESD	AEC-Q200- 002 or ISO/DIS 10605	Human body model 0612：1KV 1020 and above：2KV	±(3%+0.05Ω)
Solderability	J-STD-002	(1) 4 hrs 155℃ dry heat (2) 245±5℃ 3 sec.	±1%：±(0.5%+0.05Ω) ±5%：±(1.0%+0.05Ω)
Terminal Strength (SMD)	AEC-Q200-006	Pressurizing force for 60 seconds 0612：8N ; 1020 and above：17.7N	No broken

Automotive Array Chip Resistor

QRA Series

■ Application

— Automotive electronics
— Navigation equipment,TPMS
— Heating, Ventilating and Air conditioning
— Indoor lighting, Central door locking, Wiper module



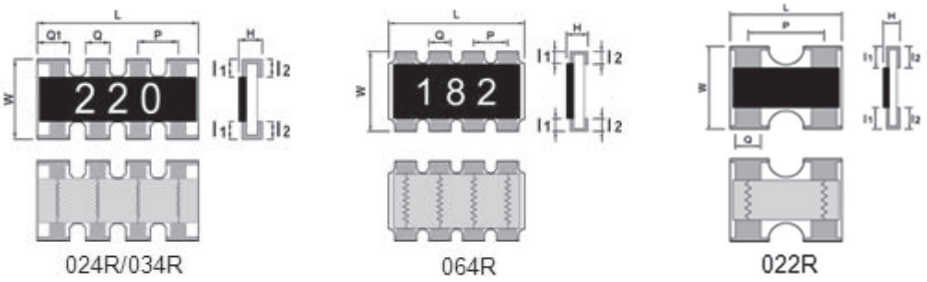
■ Features

— Small size and light weight
— Reliability, high quality
— CCD visual quality inspection
— AEC-Q200 Compliant

■ Parts Number Explanation

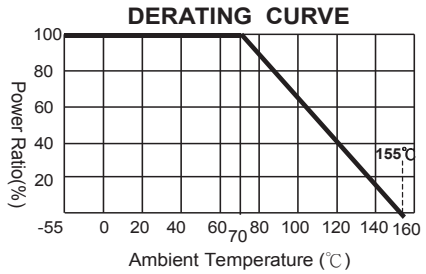
QRA	024R	J	10R0	Q	10	Z
Product Type	**Size (Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
QRA	022R(0402*2) 024R(0402*4) 034R(0603*4) 064R(1206*4)	F：±1% J：±5%	1R=1R00 10R=10R0 100R=100R 1K=1K00 1M=1M00	P：Paper Taping (034R) Q：Paper Taping (022R、024R) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS	Z：default

■ Type Dimension



Unit: mm

TYPE	L	W	H	I_1	I_2	P	Q	Q1
QRA022R	1.00±0.10	1.00±0.10	0.33±0.05	0.15±0.10	0.25±0.10	0.67±0.10	0.34±0.10	---
QRA024R	2.00±0.10	1.00±0.10	0.40±0.10	0.20±0.10	0.20±0.10	0.50±0.10	0.30±0.10	0.43±0.10
QRA034R	3.20±0.20	1.60±0.15	0.50±0.10	0.30±0.20	0.30±0.20	0.80±0.20	0.50±0.15	0.61±0.10
QRA064R	5.10±0.20	3.10±0.20	0.55±0.15	0.55±0.15	0.55±0.15	1.30±0.20	0.90±0.10	---



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

■ Standard Electrical Specifications

Item / Type	Rating Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range F(±1%)、J±(5%)
QRA022R	0.063 W	25V	50V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ
QRA024R	0.063 W	25V	50V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ
QRA034R	0.1 W	50V	100V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ
QRA064R	0.25 W	200V	400V	±400	1Ω≦R<10Ω
				±200	10Ω≦R≦1MΩ

- **For non-standard parts, please contact our sales dept.**
- **Operating Temperature Range ：−55℃～+155℃.**

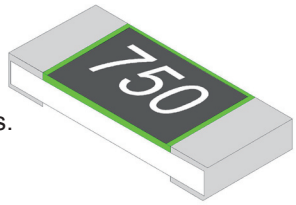
Type	022R	024R	034R	064R
Jumper Rated Current	1A			2A

■ Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	1%：±(0.5%+0.05Ω) 5%：±(1.0%+0.10Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.05Ω)
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion.	1%：±(0.5%+0.05Ω) 5% ：±(2.0%+0.05Ω)
Operational Life	MIL-STD-202 Method 108	Condition D Steady State TA=125°C at derated power.Measurement at 24±4 hours after test conclusion.	1%：±(1.0%+0.05Ω) 5% ：±(3.0%+0.10Ω)
External Visual	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.	—
Mechanical Shock	MIL-STD-202 Method 213	Test ½ Sine Pulse, Peak value: 100g, normal duration: 6ms, Velocity change:12.3ft/sec. 6 shocks in each direction, total 18 shocks.	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Test from 10-2000 Hz	±1：±(1.0%+0.05Ω) ±5：±(2.0%+0.1Ω)
ESD	AEC-Q200- 002 or ISO/DIS 10605	Human body model ：1KV	±(3%+0.05Ω)
Solderability	J-STD-002	(1) 4 hrs 155℃ dry heat (2) 245±5℃ 3 sec.	±1：±(0.5%+0.05Ω) ±5：±(1.0%+0.05Ω)
Terminal Strength (SMD)	AEC-Q200-006	Pressurizing force for 60 seconds ：8N	No broken

Fusible Chip Resistor

FCR Series



■ Application

- The accurate fusibility is applicable to safety circuits in the wide range of electronic sets.
- Small in size, light in weight.
- Low temperature coefficient. (under ±600 PPM/℃)
- Treat as the general resistance use.

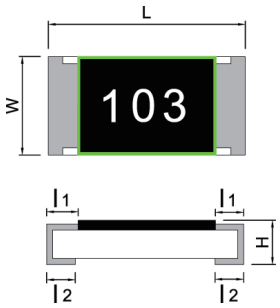
■ Features

- Small size and light weight
- Reliability, high quality
- RoHS compliant and Halogen free products

■ Parts Number Explanation

FCR	0603	J	10R0	P	05	Z
Product Type	**Size(Inch)**	**Resistor Tolerance**	**Resistors Value**	**Package**	**Quantity**	**Optional**
FCR	0402 0603 0805 1206 1210 2010 2512	F：±1% J：±5%	1R=1R00 10R=10R0 100R=100R 1K=1K00	P：Paper Taping (0603~1210) Q：Paper Taping (0402) E：Embossed Taping	04：4000PCS 05：5000PCS 10：10000PCS	Z：Default G：2512=1W 2010=0.75W 1210=0.5W

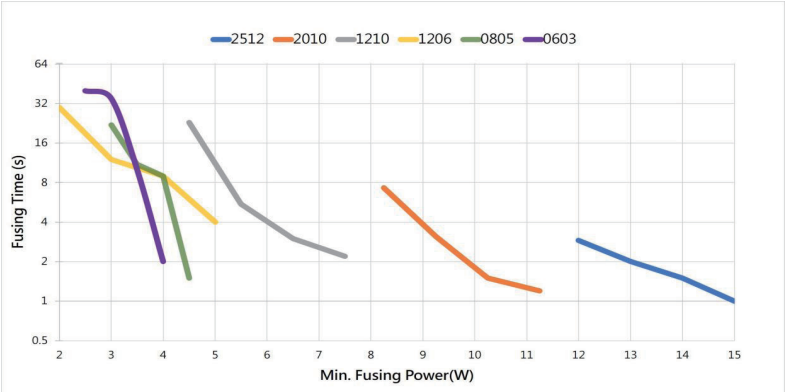
■ Type Dimension

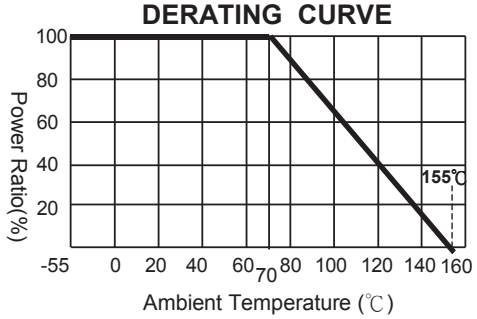


Unit: mm

TYPE	L	W	H	I_1	I_2
FCR0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.15 ± 0.10	0.20 ± 0.10
FCR0603	1.60 ± 0.20	0.80 ± 0.15	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.10
FCR0805	2.00 ± 0.20	1.25 ± 0.15	0.50 ± 0.15	0.30 ± 0.15	0.40 ± 0.15
FCR1206	3.05 ± 0.10	1.60 ± 0.20	0.55 ± 0.15	0.40 ± 0.20	0.50 ± 0.20
FCR1210	3.05 ± 0.10	2.50 ± 0.20	0.55 ± 0.15	0.50 ± 0.20	0.50 ± 0.20
FCR2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
FCR2512	6.30 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20

■ Example of Fusing Characteristics





■ Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Hold-Off Voltage	Fusing Time & Min. Fusing Power	Resistance Range	T.C.R. (PPM/℃)	Standard Tolerance (%)
FCR0402	0.063W	50V	＜30 sec at 2.5W	1Ω≦R<48Ω	±600PPM	±1%,±5%
				48Ω≦R<471Ω	±400PPM	
				471Ω≦R≦1KΩ	±200PPM	
FCR0603	0.1W	100V	＜30 sec at 3W	1Ω≦R<48Ω	±600PPM	
				48Ω≦R<471Ω	±400PPM	
				471Ω≦R≦1.8KΩ	±200PPM	
FCR0805	0.125W	150V	＜30 sec at 3.25W	1Ω≦R<48Ω	±600PPM	
				48Ω≦R<471Ω	±400PPM	
				471Ω≦R≦1.8KΩ	±200PPM	
FCR1206	0.25W	200V	＜30 sec at 5W	1Ω≦R<48Ω	±600PPM	
				48Ω≦R<471Ω	±400PPM	
				471Ω≦R≦1.8KΩ	±200PPM	
FCR1210	0.33W	250V	＜30 sec at 7.5W	1Ω≦R<48Ω	±600PPM	
				48Ω≦R<471Ω	±400PPM	
	0.5W			471Ω≦R≦1.8KΩ	±200PPM	
FCR2010	0.5W	300V	＜30 sec at 11.25W	1Ω≦R<48Ω	±600PPM	
				48Ω≦R<471Ω	±400PPM	
	0.75W			471Ω≦R≦1.8KΩ	±200PPM	
FCR2512	0.75W	400V	＜30 sec at 15W	1Ω≦R<48Ω	±600PPM	
				48Ω≦R<471Ω	±400PPM	
	1W			471Ω≦R≦1.8KΩ	±200PPM	

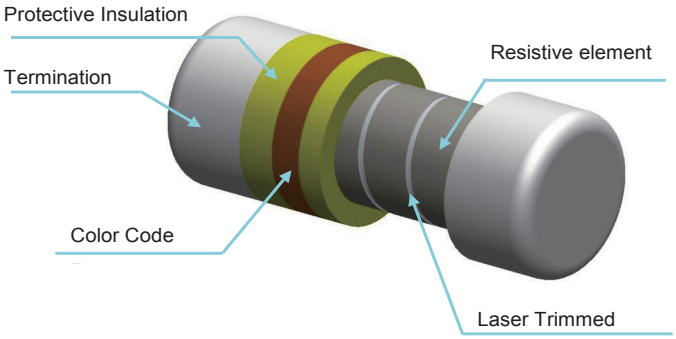
- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

■ Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+155℃, 25℃ is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.10Ω)
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5℃ for 30 seconds.	Individual leaching area ≦5% Total leaching area ≦ 10%
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	1% and below：±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.05Ω)
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃,5 cycles	1% and below： ±(0.5%+0.05Ω) 2%、5%：±(1.0%+0.10Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs. Then the resistor is left in the room for 48 hrs.	1% and below：±(0.5%+0.05Ω) 2%、5%：±(0.5%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hrs〝OFF〞.	1% and below：±(1.0%+0.05Ω) 2%、5%：±(2.0%+0.05Ω) Value <1Ω：±(2.0%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞.	1% and below： ±(1.0%+0.05Ω) 2%、5% ：±(3.0%+0.10Ω) Value <1Ω：±(3.0%+0.10Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≧10GΩ
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D： 0402、0603、0805=5mm 1206、1210、=3mm 2010、2512、=2mm	1% and below：±(1.0%+0.05Ω) 2%、5%：±(1.0%+0.05Ω)

Thin Film MELF Resistor

TRM Series



Applications

— Automotive.
— Industrial.
— Medical equipment.
— Measuring instrument.
— Communication.

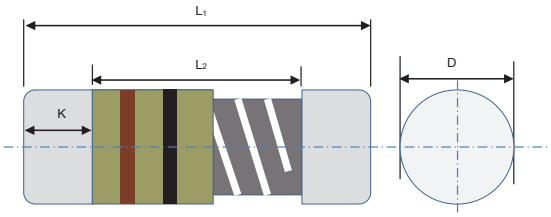
Features

— Sputtered metal thin film technology.
— High reliability and stability of ±0.3% and below per customer request.
— High precision of TCR 100、50 & 25ppm/℃ and customer request.
— Best in class pulse load capability.
— RoHS compliant and lead free.
— AEC-Q200 compliant.
— Intrinsic sulfur resistance.

Parts Number Explanation

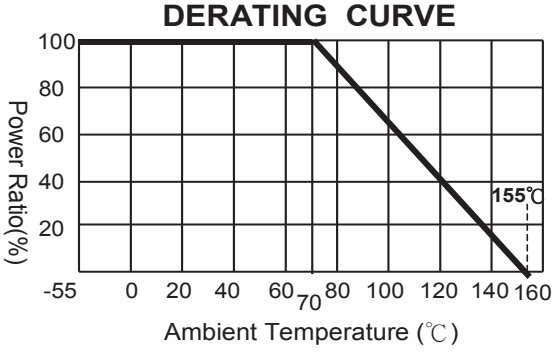
TRM	0204	X2	F	100R	E	03	25	Z
Product Type	**Size (Inch)**	**Power Rating**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm /℃)**	**Optional**
TRM	0204 0207	X2 : 0.25W 04 : 0.4W 05 : 0.5W 10 : 1W	F : ±1% D : ±0.5% C : ±0.25% B : ±0.1%	4 digits Ex 1R00 = 1Ω 10R0 = 10Ω 100R = 100Ω 2K20 = 2.2KΩ 332K = 332KΩ 1M00 = 1MΩ	E：Embossed Taping	02：2000 03：3000	25 : ±25ppm 50 : ±50ppm A0 : ±100ppm	Z: Dafault Code

Type Dimension



Unit：mm

TYPE	L_1	D	L_2	k
TRM0204	3.4 ± 0.15	1.35 ± 0.10	1.8 ± 0.10	0.70 ± 0.15
TRM0207	5.6 ± 0.20	2.15 ± 0.20	3.5 ± 0.10	1.00 ± 0.15



Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70℃.
For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.

Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range			
					B	C	D	F
					±0.1%	±0.25%	±0.5%	±1%
TRM0204	0.4W	200V	400V	±25	10Ω ~ 1MΩ			
				±50	10Ω ~ 1MΩ			1Ω~1MΩ
				±100	-			0.1Ω ~ 1MΩ
	0.25W	200V	400V	±25	10Ω ~ 1MΩ			
				±50	10Ω ~ 1MΩ			1Ω~1MΩ
				±100	-			0.1Ω ~ 1MΩ
TRM0207	1W	350V	700V	±25	10Ω ~ 1MΩ			
				±50	10Ω ~ 1MΩ			1Ω~1MΩ
				±100	-			0.1Ω ~ 1MΩ
	0.5W	300V	600V	±25	10Ω ~ 1MΩ			
				±50	10Ω ~ 1MΩ			1Ω~1MΩ
				±100	-			0.1Ω ~ 1MΩ

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range ：−55℃～＋155℃.

Reliability Test and Requirement

Test Item	Test Method	Procedure	Requirements	
			10Ω to 270KΩ	<10Ω ; >270KΩ
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55°C and 25°C /+125°C, 25°C is the reference temperature	Refer to Standard Electrical Specifications	
Short Time Overload	JIS-C-5201-1 4.13 IEC 60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(0.10%+0.05Ω) No Visual damage	±(0.15%+0.05Ω) No Visual damage
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 2 seconds.	>95% Coverage No Visual amage	
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C to +155°C, 1000 cycles	±(0.25%+0.05Ω) No Visual damage	±(0.4%+0.05Ω)
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155±5°C for 1000 +48/-0 hours.	±(0.25%+0.05Ω)	±(0.4%+0.05Ω)
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2°C, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs〝ON〞and 0.5 hr〝OFF〞	±(0.3%+0.05Ω)	
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.3%+0.05Ω)	±(0.5%+0.05Ω)
Electrostatic discharge	IEC-61340-1-3	2KV (Human Body)	±(0.5%+0.05Ω)	
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000hrs with 1.5hrs"ON" and 0.5hr "OFF".	±(0.5%+0.05Ω)	

■ Standard Nominal Resistance Values

E12	10%	10	12	15	18	22	27	33	39	47	56	68	82					
E24	2% , 5%	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	0.10% 0.25% 0.50% 1.00%	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						

MEMO

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