TOKEN ELECTRONICS IND. CO., LTD.

HONESTY PERFECTION SHARING

Catalogue of General Resistors

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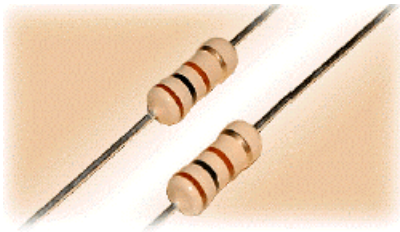
GENERAL RESISTORS INDEX

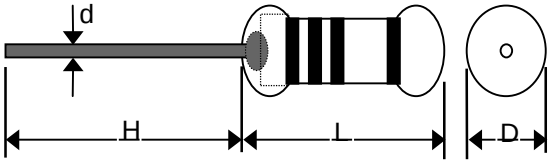
- **RD Carbon Film Fixed Resistors (CF)** ---- 3
- **RN Metal Film Resistors (MF)** ---- 4
- **RSN RSS Metal Oxide Film Fixed Resistors (MOF)** ---- 5
- **KNP Wire-Wound Resistors** ---- 6
- **KNP-N Non-Inductive Type Wire-Wound Resistors** ---- 6
- **SQ Cement Type Resistors** ---- 7
  - SQP Style ---- 7
  - SQM Style ---- 7
  - SQH Style ---- 7
  - SQZ Style ---- 8
- **FR Fusible Resistors** ---- 9
  - FRN Metal Alloy Film Type Fusible Resistors ---- 9
  - FKN Wire Wound Type Fusible Resistors ---- 9
  - FSQ Cement Type Fusible Resistors ---- 9
- **RCR Power Type Metal Glaze Anti Surge Resistors** ---- 10
- **Think Film Chip Resistors** ---- 12
  - Chip Resistors ---- 12
  - Chip Array Resistors ---- 12
- **LR Low Value Power Resistors** ---- 15
  - LR35 series ---- 15
  - LR08 series ---- 16
- **ZJ Zero Ohm/Jumper Wire Resistors** ---- 17
- **CCR Fixed Carbon Composition Resistors** ---- 18
- **CDS Photo Resistors - PGM Series** ---- 20
- **Resistor Forming Type And Dimensions** ---- 22
- **Resistor Color Code System** ---- 23
- **Significant Figures Of Nominal Resistance** ---- 24
- **Token Resistor Glossary** ---- 25

- **Precautions In Use Of Fixed Resistors** ---------- **26**
- **Precautions In Use** ---------- **27**

CARBON FILM FIXED RESISTORS



Carbon film resistors are the earliest and a still popular type of resistor and carbon film resistors are made by breaking down hydrocarbon gases at high temperature in a vacuum to form a carbon deposit on the surface of a cylindrical substrate. Trimming to value is accomplished by the cutting of spiral grooves. An alternative method of producing carbon film is to mechanically apply carbon “dust” dispersed in a curable polymeric binder. The material is painted on the substrate in a spiral pattern and cured at a moderately elevated temperature. Resistor types include general purpose. Through hole (dip type) and surface mount devices. Also included are specialty types, such as high power, high voltage and fusible resistors. Carbon film resistors also come in nonflammable coating that can withstand high temperature. Token carbon film resistors come with competitive prices and widely used in the electronics, and consumer electrical industries.



CARBON FILM RESISTORS GENERAL SPECIFICATIONS

Type	Power Rating		Dimension (mm)				Maximum Working Voltage	Maximum Overload Voltage	Resistance Range	
RD	RD	RDS	L	D	H	d±0.05			± 2%(G)	± 5%(J)
CR-12	1/8 W		3.2±0.2	1.5 ±0.2	26±1	0.40~0.45	200	400	10Ω-470K	1Ω-4.7M
CR-16	1/6 W	1/4 W	3.2±0.2	1.5±0.2	26±1	0.40~0.45	200	400	1Ω-10M	0.5Ω-22M
CR-25	1/4 W	1/2 W	6.0±0.5	2.3±0.3	26±1	0.40~0.50	250	500	1Ω-10M	0.5Ω-22M
CR-33	1/3 W	1/2 W	8.5±0.5	2.8±0.3	26±1	0.50~0.55	250	500	1Ω-10M	0.5Ω-22M
CR-50	1/2 W	1 W	9.0±0.5	3.0±0.5	26±1	0.50~0.55	350	700	1Ω-10M	0.5Ω-22M
CR-100	1 W	2 W	11±1.0	4.0±0.5	35±3	0.75~0.80	500	1000	1Ω-10M	0.5Ω-22M
CR-200	2 W	3 W	15±1.0	5.0±0.5	35±3	0.75~0.80	500	1000	1Ω-10M	0.5Ω-22M
CR-300	3 W	5 W	17±1.0	6.0±0.5	35±3	0.75~0.80	500	1000	1Ω-10M	0.5Ω-22M

ELECTRICAL PERFORMANCE

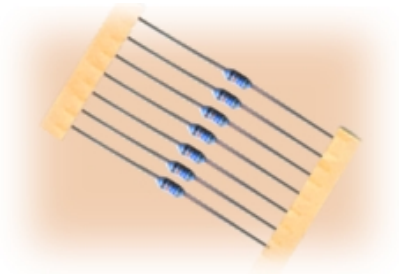
Test Items	Condition	Spec
Short Time Over Load	2.5 Times of rated voltage for 5sec.	± 1%
Load Life	70°C on-off cycle 1,000hrs.	± 5%
Moisture-Proof Load Life	40°C 95% RH on-off cycle 1,000hrs	± 5%
Soldering After Resistance	350°C for 3sec.	± 0.5%
Temperature Cycle	-30°C ~85°C 5cycles	± 2%
Resistance Temperature Coefficient	1Ω~22KΩ 22KΩ~510KΩ 510KΩ~1MΩ 1MΩ~2.2MΩ 2.2MΩ~5.1MΩ	± 300ppm /°C ± 450ppm /°C ± 800ppm /°C ± 1000ppm /°C ± 1400ppm /°C

HOW TO ORDER

RD	1/4W	100Ω	J	T/B
↓	↓	↓	↓	↓
Product Type.	Rated Power.	Resistance Value. (Ω)	Resistance Tolerance.	Forming

METAL FILM RESISTORS

Metal film resistors use nickel-chromium or a similar alloy deposited on a ceramic rod by a vacuum process of evaporation or sputtering. The final resistance value is (most commonly) defined by cutting an insulating path through the film along the length of the rod while keeping it in rotation. This electrically lengthens the resistor by producing a helix current path around the rod from end-to –end. The technology is capable of supporting precision characteristics over a broad resistance range. Resistor types include axial Through Hole through-hole and metal film fusible resistor on special purpose.



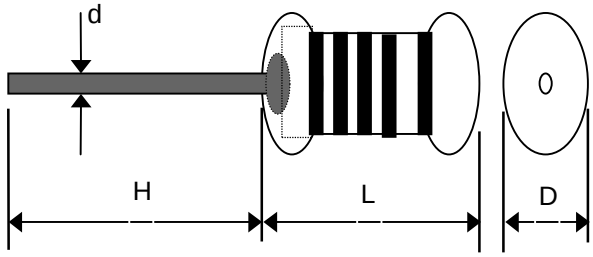
METAL FILM RESISTORS GENERAL SPECIFICATIONS

Style	Mil Style	Power Rating (W)		Dimension (mm)				Max Working Voltage		Max Overload Voltage	
		RN	RNS	L	D	H	d±0.05	RN	RNS	RN	RNS
MF – 12	RN-50	1/8W	1/4W	3.2± 0.2	1.5 ± 0.2	26 ± 1.0	0.40~0.45	200	150	400	300
MF – 25	RN-55	1/4W	1/2W	6.0 ± 0.3	2.3 ± 0.3	26 ± 1.0	0.40~0.50	250	200	500	400
MF – 50	RN-60	1/2W	1W	9.0 ± 0.5	3.0 ± 0.5	26 ± 1.0	0.50~0.55	350	250	700	500
MF – 100	RN-65	1W	2W	11 ± 1.0	4.0 ± 0.5	35 ± 3.0	0.75~0.80	500	300	1000	600
MF – 200	RN-70	2W	3W	15 ± 1.0	5.0 ± 0.5	35 ± 3.0	0.75~0.80	500	350	1000	700

RESISTANCE RANGE

Style	Mil Style	Tolerance	TC+15-25ppm	TC+50 ppm	TC+100 ppm
MF-12	RN-50	±1% ±0.5% ±0.25%	100Ω-100KΩ 100Ω-100KΩ 100Ω-100KΩ	10Ω-1MΩ	10Ω-1MΩ
MF-25	RN-55	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-511KΩ 51.1Ω-511KΩ 100Ω-300KΩ 100Ω-300KΩ	10Ω-1MΩ	10Ω-1MΩ
MF-50	RN-60	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1KΩ 51.1Ω-1KΩ 100Ω-551KΩ 100Ω-330KΩ	10Ω-1MΩ	10Ω-1MΩ
MF-100	RN-65	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1KΩ 51.1Ω-1KΩ 100Ω-551KΩ 100Ω-330KΩ	10Ω-1MΩ	10Ω-1MΩ
MF-200	RN-70	±1% ±0.5% ±0.25% ±0.1%	51.1Ω-1KΩ 51.1Ω-1KΩ 100Ω-551KΩ 100Ω-330KΩ	10Ω-1MΩ	10Ω-1MΩ

* Standard resistance is 10Ω-1MΩ, below or over this resistance on request.



HOW TO ORDER

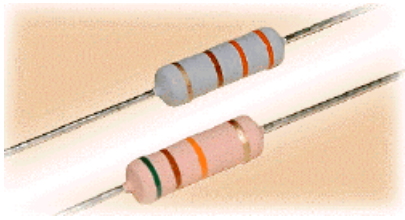
MF-25	1/4W	100Ω	J	T/B
↓	↓	↓	↓	↓
Product Type.	Rated Power	Resistance Value. (Ω)	Resistance Tolerance.	Forming

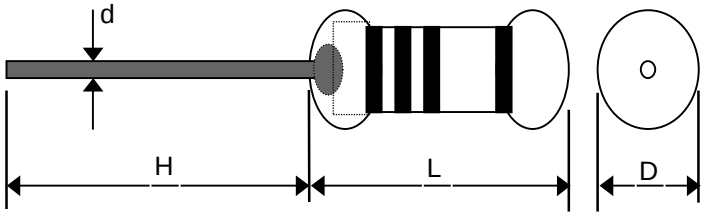
ELECTRICAL PERFORMANCE

Requirements	Characteristics	JIS C 5202	MIL-R-10509F
Operating Temp Rang	-55°C ~155°C		
Temp Coefficient (°C)	±25 ±50 ±100	5.2 A	4.6.12
Short Time Overload	±(0.5%+0.05Ω)	5.5 A	4.6.6
Dielectric Withstanding V	±(0.5%+0.05Ω)	5.7 A	4.6.8
Effect of Soldering	±(0.5%+0.05Ω)	6.4 350°C 3 sec	4.6.10
Temperature Cycling	±(0.5%+0.05Ω)	7.4	4.6.4
Low Temp Operation	±(0.5%+0.05Ω)		4.6.5
Terminal Strength	±(0.5%+0.05Ω)	6.1	4.6.7
Moisture Resistance	±(1%+0.05Ω)	7.9 1,000hrs	(MIL R-22684 4.6.10)
Load Life	±(1%+0.05Ω)	7.10 1,000hrs	4.6.13
Storage	±(0.2%+0.05Ω)	Shelved one year in a room of normal temp. and humidity	

METAL OXIDE FILM FIXED RESISTORS

Metal oxide resistors have a resistance element formed by the oxidation reaction of a vapor or spray of tin chloride solution on the heated surface of a glass or ceramic rod. The resulting tin-oxide film is adjusted to value by cutting a helix path through the film. The metal oxide film can Sustain high temperatures and electrical overloads, and supports moderate-to-precision attributes. Resistor types include high power and flameproof axial through hole and surface-mounted devices.





METAL OXIDE FILM RESISTORS GENERAL SPECIFICATIONS

TYPE		Dimension (mm)				Max Working Voltage		Dielectric Withstanding Voltage	
RSS	RSN	L	D	H	d±0.05	RSS	RSN	RSS	RSN
1/2W	1/4W	6.0 ± 0.3	2.3 ± 0.3	26 ± 1	0.40~0.50	200V	300V	400V	500V
1W	1/2W	9.0 ± 0.5	3.0 ± 0.5	26 ± 1	0.50~0.55	250V	350V	500V	600V
2W	1W	11 ± 1.0	4.0 ± 0.5	26 ± 3	0.75~0.80	300V	350V	600V	700V
3W	2W	15 ± 1.0	5.0 ± 0.5	35 ± 3	0.75~0.80	350V	350V	700V	700V
5W	3W	17 ± 1.0	6.0 ± 0.5	35 ± 3	0.75~0.80	350V	500V	700V	1000V
6W	5W	24 ± 1.0	8.0 ± 0.5	38 ± 3	0.75~0.80	500V	700V	800V	1000V
7W	6W	24 ± 1.0	8.0 ± 0.5	38 ± 3	0.75~0.80	500V	700V	800V	1000V
10W	7W	41 ± 1.0	8.0 ± 0.5	38 ± 3	0.75~0.80	750V	850V	850V	1000V
	10W	53 ± 1.0	8.0 ± 0.5	38 ± 3	0.75~0.80	750V	850V	850V	1000V

ELECTRICAL PERFORMANCE

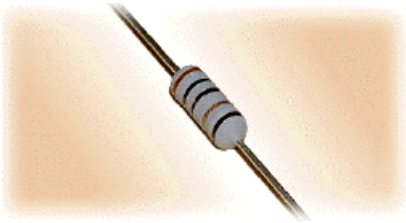
Requirements		Characteristics	Test Method	
			JIS C 5202	MIL-R-22684B
Operating Temp.Range		-55°C~200°C		
Temp. Coefficient (ppm/°C)		± 300	5.2	4.6.11
Max. Resistance Changes	Short Time Overload	± (1%+0.05Ω)	5.2 A	4.6.5
	Effect of Soldering	± (1%+0.05Ω)	6.4 350°C 2sec	4.6.9
	Temp.Cycling	± (1%+0.05Ω)	7.4 –55°C/85°C	4.6.3
	Moisture Resistance	±5%	7.9 1,000hr	4.6.10
	Load Life	±5%	7.10 1,000hr	4.6.12
Dielectric Withstanding Voltage		± (0.5%+0.05Ω)	5.7 A	4.6.7
Non-Combustibility		The resistor shall withstand Overload test in accordance with Artice UL492.2 13 without producing a fire hazard.		
Resistance to Solvents		No damage on the appearance, color bands.		

HOW TO ORDER

RSN	1W	100Ω	J	T/B
↓	↓	↓	↓	↓
Product Type.	Rated Power.	Resistance Value. (Ω)	Resistance Tolerance.	Forming

KNP WIRE-WOUND RESISTOR

Wire wound resistor construction consists of a measured length of resistance wire (metal alloy) wound on a core (usually a ceramic). The element assembly is then protected by a coating or enclosure of insulating material (such as: vitreous enamel, silicone, cement, epoxy, etc.). Wire wound Resistors are typically used where large power dissipation is required and where ac performance is relatively unimportant. Token provides wire wound resistors (KNP), and non-inductive wire wound (KNPN).

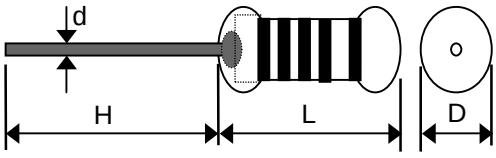


WIRE WOUND RESISTORS GENERAL SPECIFICATIONS

Type		Rated Watts	Dimensions (mm)				Resistance Range (Ω)	Tolerance
			D ± 0.5	L ± 1	H ± 3	d ± 0.05		
KNP	KNP-50	1/2W	4	9.0	26	0.50~0.55	0.1-50Ω	± 1% ~ 5%
	KNP-100	1W	4	9.0	26	0.50~0.55	0.1-50Ω	
	KNP-100B	1W	4.5	11.5	26	0.75~0.80	0.1-100Ω	
	KNP-200	2W	4.5	11.5	26	0.75~0.80	0.1-100Ω	
	KNP-200B	2W	5.5	15.5	35	0.75~0.80	0.1-200Ω	
	KNP-300	3W	5.5	15.5	35	0.75~0.80	0.1-200Ω	
	KNP-400	4W	6.5	17.5	35	0.75~0.80	0.1-300Ω	
	KNP-500	5W	6.5	17.5	35	0.75~0.80	0.1-400Ω	
	KNP-500B	5W	8.5	24.5	38	0.75~0.80	0.1-400Ω	
	KNP-600	6W	8.5	24.5	38	0.75~0.80	0.1-1KΩ	
	KNP-700	7W	8.5	24.5	38	0.75~0.80	0.1-1.5KΩ	
	KNP-800	8W	8.5	42	38	0.75~0.80	0.1-2KΩ	
	KNP-1000	10W	8.5	42	38	0.75~0.80	0.1-2KΩ	
	KNP-1000B	10W	8.5	54	38	0.75~0.80	0.1-3KΩ	
	KNP-1250	12.5W	8.5	54	38	0.75~0.80	0.1-3KΩ	
NON-INDUCTIVE TYPE WIRE WOUND RESISTORS GENERAL SPECIFICATIONS								
KNPN	KNPN-50	1/2W	4	9.0	26	0.50~0.55	0.1-10Ω	± 1% ~ 5%
	KNPN-100	1W	4	9.0	26	0.50~0.55	0.1-10Ω	
	KNPN-100B	1W	4.5	11.5	26	0.75~0.80	0.1-10Ω	
	KNPN-200	2W	4.5	11.5	26	0.75~0.80	0.1-10Ω	
	KNPN-200B	2W	5.5	15.5	35	0.75~0.80	0.1-20Ω	
	KNPN-300	3W	5.5	15.5	35	0.75~0.80	0.1-20Ω	
	KNPN-400	4W	6.5	17.5	35	0.75~0.80	0.1-30Ω	
	KNPN-500	5W	6.5	17.5	35	0.75~0.80	0.1-30Ω	
	KNPN-500B	5W	8.5	24.5	38	0.75~0.80	0.1-50Ω	
	KNPN-600	6W	8.5	24.5	38	0.75~0.80	0.1-50Ω	

ELECTRICAL PERFORMANCE

Test Items	Condition	Spec
Resistance Temp. Coeff.	-55°C ~155°C	± 300 ppm /°C
Short Time Overload	2.5 times of rated voltage 5 sec.	± (2 %+0.05Ω)
Rated Load	Rated wattage 30 min.	± (1 %+0.05Ω)
Voltage Withstanding	500VAC 1 min	± (1 %+0.05Ω)
Temp. Cycle	-30°C ~85°C 5 cycles	± (1 %+0.05Ω)
Load Life	70°C on ~ off cycle 1000 hrs.	± (5 %+0.05Ω)
Moisture-Proof Load Life	40°C 95% RH on~off cycle 500 hrs.	± (3 %+0.05Ω)
Incombustibility	16 times of rated wattage for 5 min.	Not flamed
Soldering After Resistance	350°C for 3 sec	±(0.5 %+0.05Ω)



HOW TO ORDER

KNP-100	1W	1Ω	J	T/B
↓	↓	↓	↓	↓
Product Type.	Rated Power.	Resistance Value. (Ω)	Resistance Tolerance.	Forming

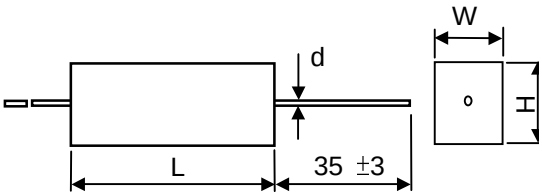
CEMENT TYPE RESISTORS

Token cement resistors are made by winding resistance wires around non-alkaline ceramic core or metal oxide film rod, which is added with a layer of heat and humidity resistant and non-corrosive protective material. The wire wound resistor is then placed in a square ceramic package sealed with special nonflammable heat-resistant cement. Token. Offers wide range cement type resistors including SQP type, SQM type, SQZ type, and SQH type.

SQP CEMENT TYPE RESISTORS DIMENSIONS

Type	Dimensions (mm)				Resistance Range(Ω)	
SQP	W±1	H±1	L±1.5	d±0.05	SQP	RS+SQP
2W	7	7	18	0.50~0.60	0.1~82	
3W	8	8	22	0.70~0.80	0.1~180	181~33K
5W	10	9	22	0.70~0.80	0.1~180	181~50K
7W	10	9	35	0.70~0.80	0.1~430	431~50K
10W	10	9	48	0.70~0.80	0.1~470	471~50K
15W	12.5	11.5	48	0.70~0.80	0.5~600	601~150K
20W.25W	14	13.5	60	0.70~0.80	0.8~1K	1.1~150K

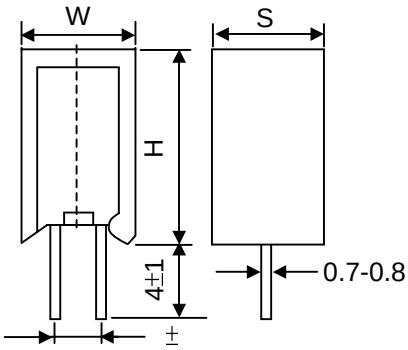
SQP



SQM CEMENT TYPE RESISTORS DIMENSIONS

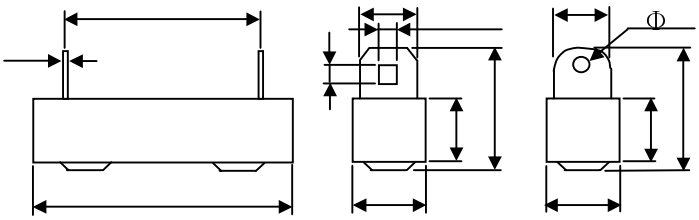
Type	Dimensions (mm)			Resistance Range(Ω)	
SQM	H±1.5	W±1	S±1	SQM	RS+SQM
2W	20	12	8	0.1-8.0	81-50K
3W	25	12	8	0.1-180	181-50K
5W	25	13	9	0.1-180	181-50K
7W	39	13	9	0.1-430	431-47K
10W	51	13	12	0.1-470	471-47K
10WS	35	16	12	0.1-430	431-47K

SQM



SQH CEMENT TYPE RESISTORS DIMENSIONS

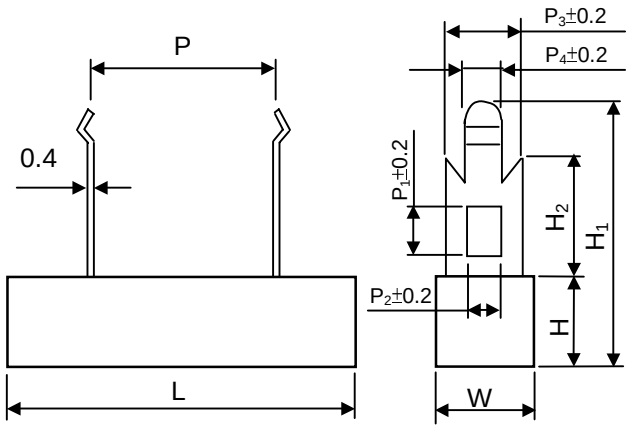
SQH



Type	Dimensions (mm)								Resistance Range (Ω)		Max Working
SQH	A±1	B±1	L±1	P±1	H±1	D±1	P_1±0.2	P_2±0.2	SQH	RS+SQH	Voltage
10W	10	9.0	48	32	21	5.0	2.5	2.0	0.1~500	500~50K	500V
15W	12.5	11.5	48	32	21	5.0	2.5	2.0	1~1K	1K~150K	600V
20W	14.5	13.5	60	43	24	6.0	3.0	2.5	1~2K	2K~150K	700V
30W	19	19	75	56	29	6.0	3.0	2.5	1~2K		700V
40W	19	19	90	67	29	6.0	3.0	2.5	2~3K		700V
50W	19	19	90	67	29	6.0	3.0	2.5	2~3K		700V

SQZ CEMENT TYPE RESISTORS DIMENSIONS

SQZ



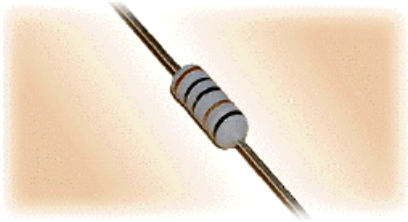
Type	Dimensions (mm)										Resistance Range(Ω)	
SQZ	L±1.5	W±1	H±1	P±1.5	P_1	P_2	P_3	P_4	H_1±1	H_2±1	SQZ	RS+SQZ
5W	25(28)	10	10	9.5(15)	4.2	2.0	5.0	1.5	25	10.5	0.1-130	131-50K
7W	36	10	10	20	4.2	2.0	5.0	1.5	25	10.5	0.1-430	431-50K
10W	48	10	10	32	4.2	2.0	5.0	1.5	25	10.5	0.2-470	471-50K
15W	48	12.5	12	32	4.2	2.0	5.0	1.5	26	10.5	1-600	601-150K
20(25WS)	60	15	13	42	7.0	6.0	10	2.7	36	15.0	1-1K	1.1K-150K

ELECTRICAL PERFORMANCE		
Test Items	Condition	Spec
Resistance Temp. Coeff.	-30°C ~ 200°C	± 300ppm / °C
Short Time Over Load	2.5 times of rated voltage for 5 sec.	± (2 %+0.05Ω)
Rated Load	Rated wattage for 30 min.	± (1 %+0.05Ω)
Voltage Withstanding	800V AC 1 min.	No charge
Temp. Cycle	-30°C ~ 85°C for 5 cycles	± (1 %+0.05Ω)
Load Life	70°C on-off cycle 1000hrs.	± (5 %+0.05Ω)
Moisture-proof Load Life	40°C 95% RH on-off cycle 500 hrs.	± (5 %+0.05Ω)
Incombustibility	16 times of rated wattage for 5 min.	Not flamed

HOW TO ORDER

SQP	5W	100Ω	J	Bulk
↓	↓	↓	↓	↓
Product Type.	Rated Power.	Resistance Value. (Ω)	Resistance Tolerance.	Packing-Code

FUSIBLE RESISTORS



Fusible resistors are specially spiraled to provide the fusible function with flame retardant coating. Fusible resistors contain both functions, as being a resistor in normal condition and changed into a fuse while abnormal current comes into the protected PCB or equipments. Token fusible resistors are widely used in constant voltage designed; overload protection, capplicable for battery chargers, TV sets, cordless phones, and PC/CPU coolers. Token provides metal film fusible resistors (FRN), carbon film fusible resistors (FRN), wire wound fusible resistors (FKN), and cement type fusible resistors (FSQ).

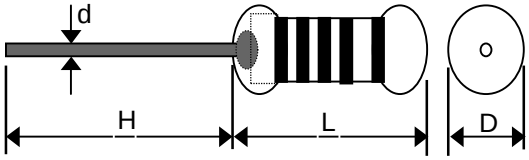
FUSIBLE RESISTORS GENERAL SPECIFICATIONS

Type	Rated Wattage	Dimension (mm) L ± 1.5	D ± 1	H ± 0.5	W ± 0.5	H ± 3	d ± 0.05	Resistance Range	Dielectric Withstanding Voltage
FRN	1/4W	6	2.3			26	0.40~0.50	0.22Ω~ 100KΩ	300V
	1/2W	6	2.3			26	0.50~0.55	0.22Ω~ 100KΩ	300V
	1W	9	3.0			26	0.50~0.55	0.22Ω~ 100KΩ	350V
	2W	11	4.0			26	0.75~0.80	0.3Ω~ 100KΩ	500V
	3W	15	5,0			35	0.75~0.80	0.3Ω~ 100KΩ	500V
FKN	1W	9	4.5			26	0.75~0.80	0.1Ω~ 22Ω	500V
	2W	11	5.0			26	0.75~0.80	0.1Ω~ 60Ω	500V
	3W	15	5.5			35	0.75~0.80	0.1Ω~ 100Ω	500V
	5W	17	6.5			35	0.75~0.80	0.2Ω~ 200Ω	500V
	6W	24	8.5			38	0.75~0.80	0.3Ω~ 250Ω	500V
FSQ	2W	18		7	7	35	0.75~0.80	0.1Ω~ 22Ω	1000V
	3W	22		8	8	35	0.75~0.80	0.1Ω~ 120Ω	1000V
	5W	22		9	10	35	0.75~0.80	0.2Ω~ 120Ω	1000V
	7W	35		9	10	35	0.75~0.80	0.3Ω~ 250Ω	1000V
	10W	48		9	10	35	0.75~0.80	0.3Ω~ 500Ω	1000V

FSQ dimensions refer to SQP CEMENT TYPE RESISTORS DIMENSIONS

ELECTRICAL PERFORMANCE

Test Items	Condition	Spec.
Operating Temp.	-40°C ~240°C	
Resistance Temp. Coeff.	-30°C ~150°C	± 200PPM / °C
Short Time Overload	2.5 times of rated voltage for 5 sec.	± 2 %
Temp. Cycle	-30°C ~85°C for 5 cycles	± ((1 %+0.05Ω)
Load Life	25°C on-off cycle 1,000 hrs.	± (5 %+0.05Ω)
Moisture-Proof Load Life	40°C 95 % RH on-off cycle 1,000 hrs.	± (5 %+0.05Ω)
Solder Pot	270°C for 3 sec.	± (1 %+0.05Ω)
Incombustibility	16 times of rated wattage for 5 min	Not flamed



FUSING CHARACTERISTICS

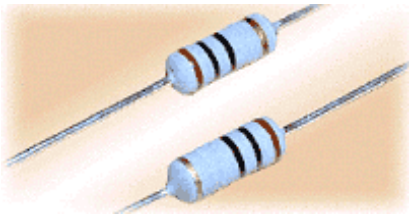
Power Wattage	Fusing Time
16 X Rated Wattage	Within 2 min
24 X Rated Wattage	Within 1 min
32 X Rated Wattage	Within 30 sec.

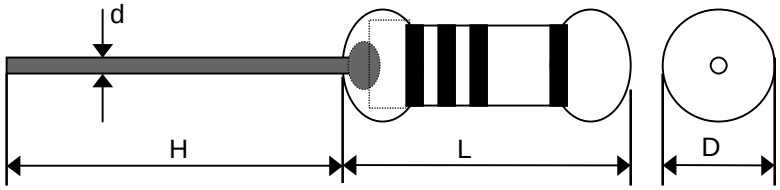
HOW TO ORDER

FRN	1/2W	0.47Ω	J	T/B
↓	↓	↓	↓	↓
Product Type.	Rated Power.	Resistance Value. (Ω)	Resistance Tolerance.	Forming

POWER TYPE METAL GLAZE ANTI SURGE RESISTOR (RCR)

Power Type Metal Glaze Anti Surge Resistors (RCR) are made by metal glaze coating on the surface of a cylindrical substrate with excellent anti-surge characteristics and stable at even high resistance range. Token metal glaze anti surge power type resistors come with competitive prices and are widely used in the power source protector like fluorescent's inverter, and starting resistor for Mercury Lamp. For high value resistance application, metal glaze anti-surge resistors are widely used in computer and electronics, like protector of eliminate electrostatic and thunder lightning.





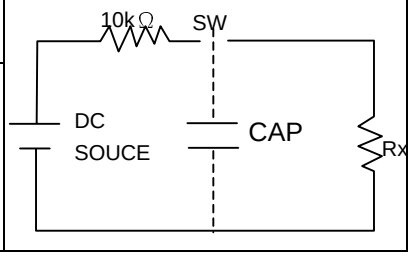
ANTI SURGE RESISTOR GENERAL SPECIFICATION

Type	Power Rating	L	D	H	d±0.05
RCR25	1/4W	6.5±1	2.3±0.5	26±3	0.50~0.60
RCR50	1/2W	9.5±1	3.4±0.5	26±3	0.50~0.60
RCR100	1W	12.0±1	4.0±0.5	26±3	0.70~0.80
RCR200	2W	16.0±1	6.1±0.5	26±3	0.70~0.80
RCR300	3W	17.0±1	7.0±0.5	26±3	0.70~0.80
RCR500	5W	24.0±1	8.0±0.5	26±3	0.70~0.80

ANTI SURGE RESISTOR POWER RATING

Type	Power Rating	Max Working Voltage	Max Overload Voltage	Dielectric With-standing Voltage	TCR (ppm /°C)	Resistance Range E24.J (±5%) E96.F.(±1%)	Operating Temp. Range
RCR25	1/4W	500V	700V	500V	±350	1Ω~33MΩ	-20℃ ~+155℃
RCR50	1/2W	1000V	1500V	600V		1Ω~68MΩ	
RCR100	1W	1500W	2500W	800W		1Ω~100MΩ	
RCR200	2W	2000W	3000W	800W		1Ω~100MΩ	
RCR300	3W	2500W	4000W	1000W		1Ω~100MΩ	
RCR500	5W	3000W	5000W	1000W		1Ω~100MΩ	

LOADING CONDITIONS

Surge Voltage		Cap.	Anti-Surge Characteristics	Surge Test Condition	
1Ω~100Ω	600V	0.6uF	In accordance with IEC 65 Safety specification.	(2.5 Sec. ON + 2.5 Sec. Off) ×10 Cycles ΔR≦50%	
100Ω~1K	800V				
1K~10K	5KV	0.01uF			
10K~1M	7KV				
1M~33M	10KV				

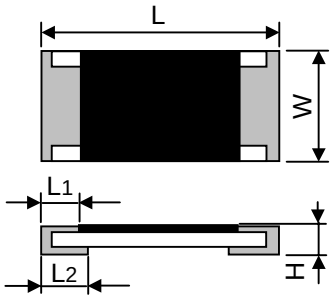
ELECTRICAL PERFORMANCE				
Requirements		Characteristics	Test Method	
			JIS C 5202	MIL-R-22684B
Operating Temp. Range		-20°C~155°C		
Temp. Coefficient (ppm/°C)		± 200; ±350	5.2	4.6.11
Max. Resistance Changes	Short Time Overload	± (2.5%+0.05Ω)	5.2 A	4.6.5
	Effect of Soldering	± (2%+0.05Ω)	6.4 350°C 2sec	4.6.9
	Temp. Cycling	± (2%+0.05Ω)	7.4 –20°C/85°C	4.6.3
	Moisture Resistance	±(5%+0.1Ω)	7.9 1,000hr	4.6.10
	Load Life	±(5%+0.1Ω)	7.10 1,000hr	4.6.12
Dielectric Withstanding Voltage		± (10%+0.05Ω)	5.7 A	4.6.7
Insulation Resistance		Over. 10MΩ	5.6 A	4.6.8
Non-Combustibility		The resistor shall withstand Overload test in accordance with Artice UL492.2 13 without producing a fire hazard.		
Resistance to Solvents		No damage on the appearance, color bands.		

HOW TO ORDER

RCR50	1/2W	220KΩ	J	T/B
↓	↓	↓	↓	↓
Product Type.	**Rated Power.**	**Resistance Value. (Ω)**	**Resistance Tolerance.**	**Forming**

THINK FILM CHIP RESISTORS

Token think film chip resistors are formed by vacuum depositing a resistive alloy on a usually flat substrate of ceramic. Photolithographic or similar techniques are used to define the final geometry of the resistors and interconnecting traces. This technology provides for close ratio matching and tracking of resistors in a network, as well as low stand-alone temperature coefficient and resistance tolerance. Resistor types include precision chip resistors (FCR), chip array resistor (RCA), and chip resistor networks (RCN).



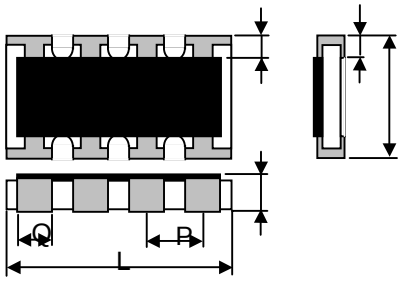
THINK FILM CHIP RESISTORS DIMENSIONS

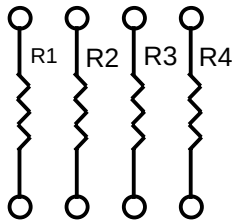
Dimensions Type	L	W	H	L_1	L_2
FCR 03	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
FCR 05	2.00± 0.15	1.25±0.15	0.50±0.10	0.40±0.20	0.35±0.15
FCR 06	3.10± 0.15	1.55±0.15	0.55±0.10	0.50±0.25	0.50±0.25

CHIP RESISTORS RATING

Type	Power Rating at 70°C	Max. RCWV	Max Overload Voltage	Resistance Tolerance (%)	Resistance Range (Ω) Min	Resistance Range (Ω) Max	Standard Resistance Values
FCR03	1/10W	50V	100V	± 1%(F) ± 5%(J)	10Ω 1Ω	1MΩ 10MΩ	E-96 E-24
FCR05	1/8W	150V	300V	± 1%(F) ± 5%(J)	10Ω 1Ω	1MΩ 10MΩ	E-96 E-24
FCR06	1/4W	200V	300V	± 1%(F) ± 5%(J)	10Ω 1Ω	1MΩ 10MΩ	E-96 E-24

CHIP ARRAY RESISTORS DIMENSIONS





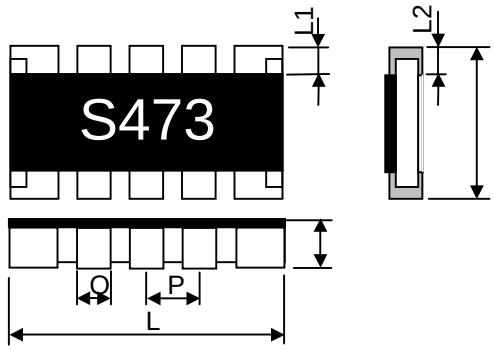
R1 = R2 = R3 =

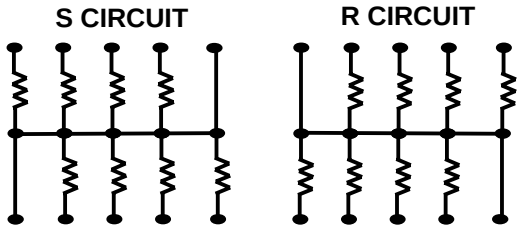
Dimensions Type	L	W	H	L_1	L_2	P	Q
RCA03-4D (0603)	3.2±0.2	1.6 ± 0.15	0.5 ± 0.1	0.30 ± 0.15	0.35Max	0.8 ± 0.1	0.5 ± 0.1

CHIP ARRAY RESISTORS RATING

Type	Rated Power at 70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R (ppm/°C)	Resistance Range F (± 1%) E-96	Resistance Range G (± 2%) J (± 5%) E-24	Jumper Rated Current	Jumper Resistance Value	Operating Temperature Range
RCA03-4D (0603)	0.063	50V	100V	± 200	100Ω~470KΩ	10Ω~1MΩ	1A	50mΩMax	-55°C ~ +125°C

CHIP RESISTORS NETWORK DIMENSIONS





Dimensions Type	L	W	H	L1	L2	P	Q
RCN06-10R RCN06-10S	6.4 ± 0.2	3.1 ± 0.2	0.55 ± 0.1	0.5 ± 0.3	0.5 ± 0.2	1.27 ± 0.1	0.8 ± 0.2

CHIP RESISTORS NETWORK RATING

Type	Rated Power at70°C	Max. Working Voltage	Max. Overload Voltage	T.C.R (ppm/°C)	Resistance Range J (± 5%) E-12	Number of Terminals	Number of Resistor	Operating Temperature Range
RCN06-10R RCN06-10S	1/16W	50V	100V	± 200	10Ω~1MΩ	10	8	-55°C ~ +125°C

CHIP RESISTORS SPECIFICATIONS

Item	Specification	Test Method
DC Resistance	J: ± 5%, F: ± 1%	JIS C 5202 5.1
Temperature Coefficient of Resistance (TCR)	J: ± 200 ppm/°C F: ± 100 ppm/°C	JIS C 5202 5.2 / IEC 115-1 4.8.4.2
Short Time Overload	J: ΔR≦± (2%+0.1Ω) F: ΔR≦± (1%+0.05Ω)	JIS C 5202 5.5 / IEC 115-1 4.13 2.5xRated voltage (Max. Overload Voltage) for 5 sec measure resistance after 30 minutes
Resistance to Solder Heat	J: ΔR≦± (1%+0.1Ω) F: ΔR≦(0.5%+0.05Ω) No mechanical damage	JIS C 5202 6.4 / IEC 115-1 4.18 With 260 ± 5°C for 10 ± 1 sec.
Solder ability	Over 95% of termination must be covered with solder	JIS C 5202 7.4 / IEC 115-1 4.17 After immersing flux, dip in the 235 ± 5°C molten solder bath for 2 ± 0.5 sec.
Temperature Cycle	J: ΔR≦(1%+0.1Ω) F: ΔR≦± (0.5%+0.05Ω) No mechanical damage	JIS C 5202 7.4 / IEC 115-1 4.19 Repeat 5 cycles as follows -55°C (30minutes)+25°C (10~15minutes) +125°C (30minutes)+25°C (10~15minutes)
Temperature Strength	ΔR≦± (0.5%+0.05Ω) No mechanical damage	JIS C 5202 6.1 500g for 10 seconds
Load Life	J: ΔR≦± (3%+0.1Ω) F: ΔR≦± (1%+0.05Ω)	JIS C 5202 7.10 / IEC 115-1 4.25.1 Permanent resistance change after 1000+48/-0 hours (1.5 hours ON, 0.5hour OFF) at RCWV or Max. Keep the resistor at 70 ± 3°C ambient
Load Life Humidity	J: ΔR≦± (3%+0.1Ω) F: ΔR≦± (1%+0.05Ω)	JIS C 5202 7.9 / IEC 115-1 4.24.2 Maintain the temperature of the resistor at 40 ± 2°C and 90~95% RH with the rated voltage applied. Cycle ON for 1.5hours and Off for 0.5hour for 1000+48/-0 hours. After one hour, measure the resistance value.
Intermittent Overload	ΔR≦± (5%+0.1Ω) No mechanical damage	JIS C 5202 5.8 2.5xRated Voltage (Max. Overload Voltage), 1secON, 25sec OFF, test 10,000 cycles

CHIP RESISTORS MARKING

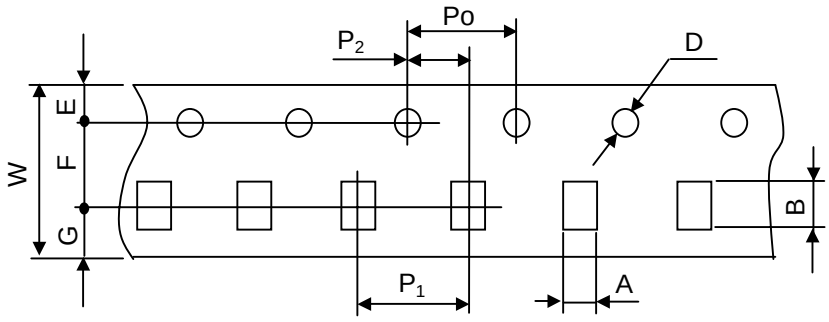
3 digit marking
for E24 (J)
100 ~ 10Ω
122 ~ 1.2KΩ
473 ~ 47KΩ

4 digit marking
for E96 (F)
22R1 ~ 22.1Ω
1020 ~ 102Ω

3 digit marking
for E96 (F)
02C
102 X 10^2 = 10.2K

15E
140 X 10^4 = 1.4M

CHIP RESISTORS TAPING

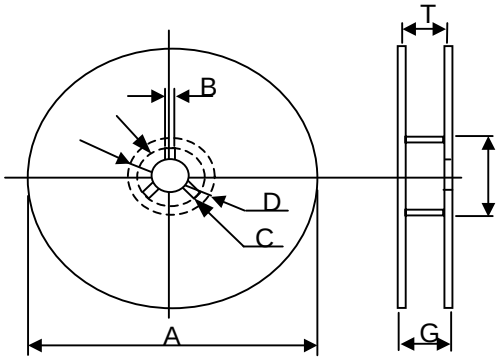


CHIP RESISTORS TAPING

Type	A	B	W	F	E	P_1	P_2	P_0	D	G
FCR03	1.10 ± 0.20	1.90 ± 0.20	8.0 ± 0.3	3.50 ± 0.05	1.75 ± 0.10	4.0 ± 0.1	2.00 ± 0.05	4.0 ± 0.1	1.5 + 0.1 -0	2.75
FCR05	1.65 ± 0.20	2.45 ± 0.20	8.0 ± 0.3	3.50 ± 0.05	1.75 ± 0.10	4.0 ± 0.1	2.00 ± 0.05	4.0 ± 0.1	1.5 + 0.1 -0	2.75
FCR06	2.00 + 0.10 -0.15	3.57 + 0.10 -0.15	8.0 ± 0.3	3.50 ± 0.05	1.75 ± 0.10	4.0 ± 0.1	2.00 ± 0.05	4.0 ± 0.1	1.5 + 0.1 -0	2.75

CHIP RESISTOR SPACKAGE

Symbol	Dimension
A	178 ± 2.0
N	80.0 ± 0.5
C	13.0 ± 0.5
D	20min
B	20 ± 0.5
G	100 ± 1.5
T	14.9 max.



PART NUMBER EXPLANATION

RCA	03	4	D	103		J	TP	
↓	↓	↓	↓	↓		↓	↓	
Type	**Size**	**Number of Circuits**	**Circuit Structure**	**Nominal Resistance**		**Resistance Tolerance**	**Packaging**	
Chip Resistor Array	03(0603)	4:4 circuits	D: Independent	Resistors 3-Digit	E24 Series EX 2.2Ω=2R2 100Ω=101	F=±1% C=±2% J=±5%	TP	Taping (Paper)
				4-Digit	E96 Series EX 10.2R=10R2 10KΩ=1002		BA	Bulk Case
				Jumper	000			

LOW VALUE POWER RESISTORS

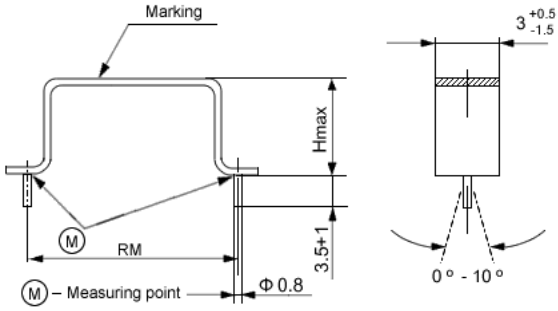
Features：Current detective resistors for power supply circuit. Easy soldering. Low inductance.

SPECIFICATION：

Type	LR	350-009	351-009 351-010	352-009 352-010 352-011
Power rating P_{70}	W	0.5	1.0	1.5
Resistance range	Ω	R003~R051	R004~R068	R006~R10
E-series		E24≧R010		
Tolerances	%	±1, ±3, ±5, ±10		
Temperature coefficient	ppm/°C	＋200~＋1200		
Max. Cont. working voltage	VRMS	For all styles		
Insulation voltage (1min.)	VRMS	$\sqrt{P70xR}$ Non insulated		
Insulation resistance	Ω	Non insulated		
Derating, linear	°C	70~300(0W)		
Climatic category		55	200	56
Temperature range	°C	-50~300		
Thermal resistance	KW-1	200	100	70
Failure rate (Total, ν_0 max, 60% conf. Lev.)	10-9*h-1	Ca.10, Depends on value		
Endurance (P_{70}, 70,1000h)	$\frac{\Delta R}{R}$ %	±3.0		
Damp heat ,steady state(40℃,93% r.h.,56d)	$\frac{\Delta R}{R}$ %	%		
Climatic sequence	$\frac{\Delta R}{R}$ %	±0.5		
Terminal strength	$\frac{\Delta R}{R}$ %	±0.5		
Terminal tensile strength	N	30		
Resistance to soldering heat (260℃,10s)	$\frac{\Delta R}{R}$ %	±0.2 typ.		
Solder ability	s	2.5 Flow time, solder globule test IEC 60068-2-20-T		
Making		Value imprinted		

DIMENSION IN MM:

Type	RM	H max.
LR350-009	10	6.5
LR351-009		10.5
LR352-009		17.0
LR351-010	15	8.0
LR352-010		14.5
LR352-011	20	12.0



Construction：The resistive elements consist of a flat metal-band. Spot welded Cu-terminals ensure high stability of contacts. Thus, this construction results in a no inductive resistor of both high stability and overload capacity.

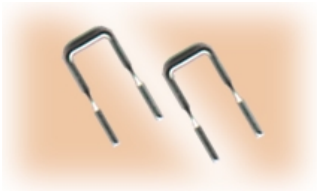
PACKAGING:

Type	Pieces	Pack. –Code
LR350-009	200pcs	Bulk
LR351-009 LR351-010	200pcs	Bulk
LR352-010 LR352-011	200St.	Bulk

Ordering example:	LR351-009	R024	5%	Bulk
	Type	Value	Tolerance	Pack-Code

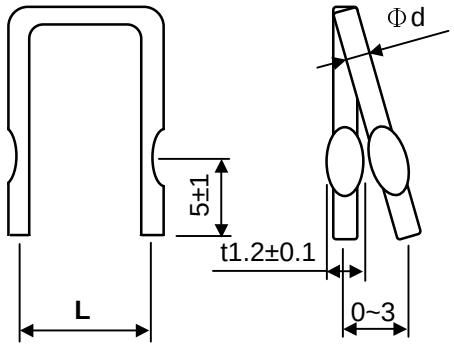
LOW VALUE WIRE RESISTORS

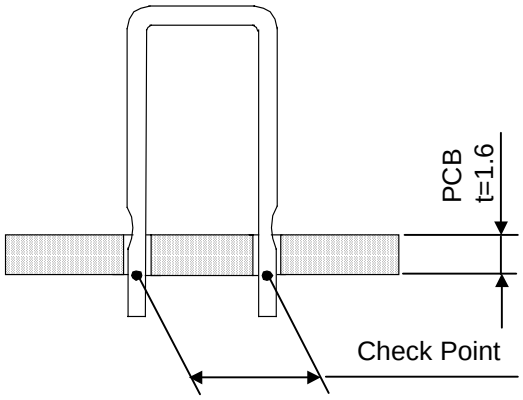
Current detective resistors for power supply circuit.
The resistive element of a Ni-Cu alloys.
Easy soldering.
Low inductance.



LOW VALUE WIRE RESISTOR GENERAL SPECIFICATION						
Type	Max. Current Rating (A)	Resistance (mΩ)	Tolerance (%)	T.C.R ppm/°C	Rated Ambient Temp. (°C)	Operating Temp. (°C)
LR0805	4.5	20	J:±5%	±100	+70°C	-40~+155°C
LR0810	4.5	20	J:±5%	±100	+70°C	-40~+155°C

DIMENSION IN MM:			
Type	L ±1	t ± 0.1	d± 0.5
LR0805	5	1.2	0.8
LR0810	10	1.2	0.8





Resistance check point

PACKAGING:		
Type	Pieces	Pack. –Code
LR0805	2000pcs	Bulk
LR0810	2000pcs	Bulk

Ordering example:	LR0805	R020	5%	Bulk
	Type	Value	Tolerance	Pack-Code

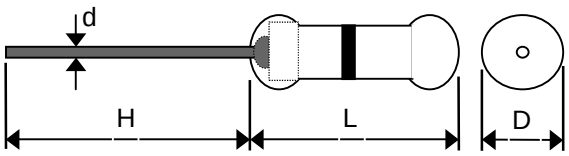
ZERO OHM/JUMPER WIRE RESISTORS

Zero ohms are developed for the interconnection device Between points on a P.C. Board as jumper wires or Crossovers. Token offer a quick solution to the following problems, (1) Inability to connect two points on a P.C. Board due To other circuit paths which must be crossed over. (2) An After the fact design the requires new point connections. (3) Circuit tuning by changing point connections. Zero ohms are especially suited for automatic machine insertion. Token offers zero ohm resistors (ZO) and jumper wire resistors (JW).

ZERO OHM RESISTOR GENERAL SPECIFICATION

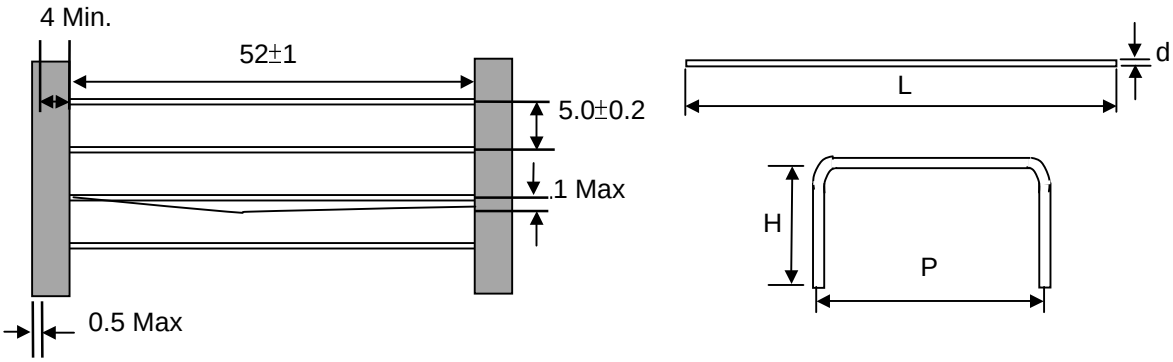
Type	Rating	Dimension (mm)			d +0.02–0.04
		L Max.	D Max.	H ± 3	
ZO-1/8	0.125W	4.2	2.0	28	0.5
ZO-1/4	0.25W	6.8	2.5	28	0.5

ZO-TYPE



JUMPER WIRE RESISTOR GENERAL SPECIFICATION

JW-TYPE



Type	L±1	d+0.02 -0.04	H	P
ZW-A	61.5	0.5	3 - 10	5 - 30
ZW-B	61.5	0.6	3 - 10	5 - 30

ELECTRICAL PERFORMANCE

Requirements	Characteristics
Maximum Resistance	0.01Ω
Lead Material	Tin-plated copper
Body Material	Electrical grade, high performance molding compound
Dielectric Withstanding Voltage	Atmospheric-500V RMS, Reduced-325V RMS
Insulation Flammability	Resistor Insulation is self extinguishing within 10 seconds after externally applied flame is removed.
Current Rating	25 Amps. at 25°C, dreating to 0 Amps.150°C

HOW TO ORDER

ZO-1/4	0.25W	T/B
↓	↓	↓
Product Type.	Rated Power.	Forming

FIXED CARBON COMPOSITION RESISTOR (CCR)

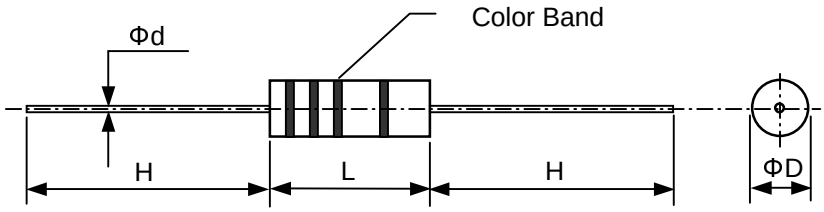
Features
Excellent characteristic against high voltage surge current.
Higher reliability for disconnection failure comparing to wire wound resistors and film resistors.

Applications
TV, CRT display, Copy machine.
LBP, VTR, Switch power supply, AC adapter.

General Specification

Type	Power Rating	L	ΦD	H	Φd
CCR	1/4W	6.3 +1.0 -1.5	2.3±0.3	27±3	0.60±0.05
CCR	1/2W	10 +0.5 -1.5	3.5±0.3	27±3	0.68±0.05

Unit: mm

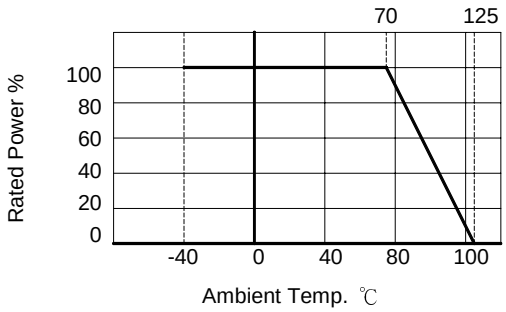


Rating

Type	Power Rating	Resistance Range	Tolerance E12, E24	Max Working Voltage	Max Overload Voltage	Rated Ambient Temp.	Operating Temp. Range
CCR	1/4W	2.2Ω~12MΩ	J (±5%)	250V	400V	+70°C	-20°C~+125°C
CCR	1/2W	2.2Ω~22MΩ	K (±10%)	350V	700V	+70°C	-20°C~+125°C

Rated Voltage=$\sqrt{\text{Power Rating x Resistance Value}}$ or Max, working voltage, whichever is lower.

Derating Curve



Performance				
Description		**Performance Requirements**		**Test Method**
Resistance Temperature Coefficient	Resistance Range	Maximum Resistance Value change %		Test Temperature +20 ℃ /-20℃ /+20 ℃ /+100 ℃ /+20 ℃
		-20~+20℃	+20~+100℃	
	＜1 KΩ	±6.5%	±5.0%	
	1.1KΩ~10KΩ	±10%	±6.0%	
	11KΩ~100KΩ	±13%	±7.5%	
	110KΩ~1MΩ	±15%	±10%	
	1.1MΩ~10MΩ	±20%	±15%	
	＞11MΩ	±25%	±20%	
Short-time Overload		△R≦±2.5%		Rate voltage x 2.5 or maximum overload voltage (the lower) 5 sec.
Insulation Resistance		≧1000MΩ		Testing voltage 500V 1 minute
With Standing Voltage		No flashover or breakdown		2times maximum working voltage 1 minute
Terminal Strength	Pulled	△R≦±2% No visible damage		Load 10N 10s
	Winded			Load 10N 4×90°
	Twisted			3×360° in opposite direction
Resistance to Vibration		No visible damage Within ±1%		10~50Hz 3 direction 2 hours each
Solder-heat Resistance		△R≦±5% Marks legible, no visible damage		350°C 4mm from the body, 3seconds
Solder ability		At least 95% of the dipping surface must be covered by new solder, no flaws gathered.		235°C 2mm from the body, 2 seconds
Temperature Cycle		△R≦±2% No visible damage		-20℃(30 min.)/+85℃(30 min.) 5 cycles
Humidity		△R≦±10% No visible damage		40℃ 95% RH 240 hours
Load Life		△R≦±10% No visible damage, markings legible		Rated voltage or maximum working voltage, 1.5 hours “ON”, 0.5 hours “OFF”, 70℃ 1000 hours

HOW TO ORDER

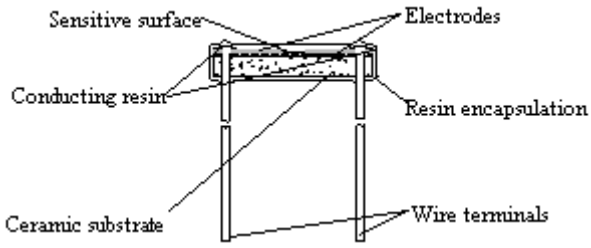
CCR	1/2W	120Ω	K	P
↓	↓	↓	↓	↓
Product Type.	**Rated Power.**	**Resistance Value. (Ω)**	**Resistance Tolerance.**	**Forming**

CDS PHOTO RESISTORS - PGM SERIES

Description:

Photo resistors are thin film devices which resistance changes with change of the light falling on it as figure 1. The specification provides the mechanical data, electronic characteristics and test conditions of Token photo resistors in terms of 5 mm, 12 mm, and 20 mm.

Fig. 1:



Outline Dimensions (see Fig.2 ~ Fig.4)

Fig.2 (5mm type)

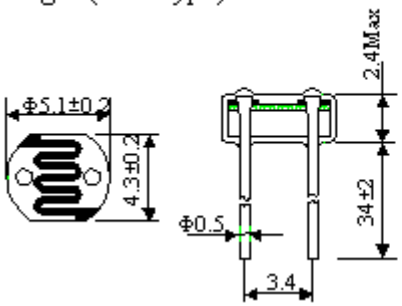


Fig.3 (12mm type)

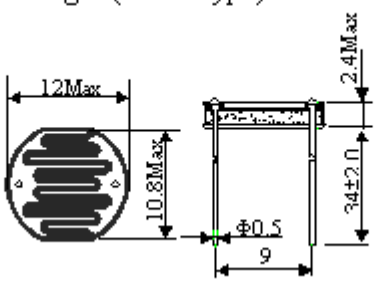
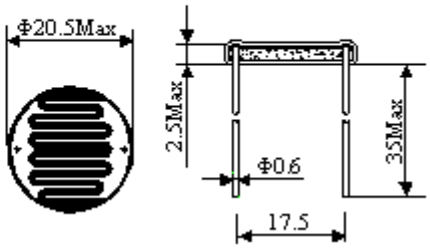


Fig.4 (20mm type)



Note: All dimensions are in mm and NTS.

Electronics characteristics:

Table 1: 5mm type

Model	V_{max} (VDC)	P_{max} (mW)	Ambient Temp (℃)	Spectral Peak (nm)	Photo Resist. (10Lx) (KΩ)	Dark Resist. (MΩ)	γ min	Response Time (ms)	
								Rise	Decay
PGM5516	100	90	-30 ~ +70	540	5 ~ 10	0.2	0.6	30	40
PGM5526	150	100	-30 ~ +70	540	8 ~ 20	1.0	0.6	20	30
PGM5537	150	100	-30 ~ +70	540	16 ~ 50	2.0	0.7	20	30
PGM5539	150	100	-30 ~ +70	540	30 ~ 90	5.0	0.8	20	30
PGM5549	150	100	-30 ~ +70	540	45 ~ 140	10.0	0.8	20	30

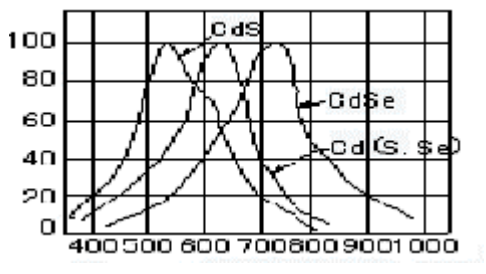
Table 2: 12mm type

Model	V_{max} (VDC)	P_{max} (mW)	Ambient Temp (℃)	Spectral Peak (nm)	Photo Resist. (10Lx) (KΩ)	Dark Resist. (MΩ) min	γ min	Response Time (ms)	
								Rise	Deca
PGM1200	250	250	-30 ~ +70	560	2～5	1.0	0.6	30	40
PGM1201	250	250	-30 ~ +70	560	4～10	2.0	0.7	30	30
PGM1202	250	250	-30 ~ +70	560	8～20	5.0	0.7	30	30
PGM1203	250	250	-30 ~ +70	560	18～50	10	0.8	30	30
PGM1204	250	250	-30 ~ +70	560	45～150	20	0.8	30	30
PGM1205	250	250	-30 ~ +70	560	140～300	20	0.8	30	30

Table 3: 20mm type

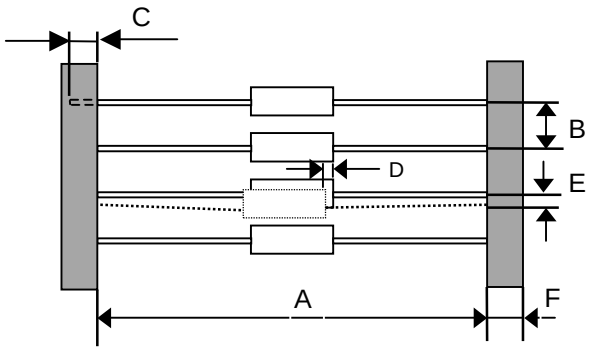
Model	V_{max} (VDC)	P_{max} (mW)	Ambient Temp (℃)	Spectral Peak (nm)	Photo Resist. (10Lx) (KΩ)	Dark Resist. (MΩ) min	γ min	Response Time (ms)	
								Rise	Deca
PGM2000	500	500	-30 ~ +70	560	2~5	1.0	0.6	30	40
PGM2001	500	500	-30 ~ +70	560	4~10	2.0	0.7	30	30
PGM2002	500	500	-30 ~ +70	560	8~20	5.0	0.7	30	30
PGM2003	500	500	-30 ~ +70	560	18~50	10	0.8	30	30
PGM2004	500	500	-30 ~ +70	560	45~150	20	0.8	30	30
PGM2005	500	500	-30 ~ +70	560	140~300	20	0.8	30	30

Terminology:

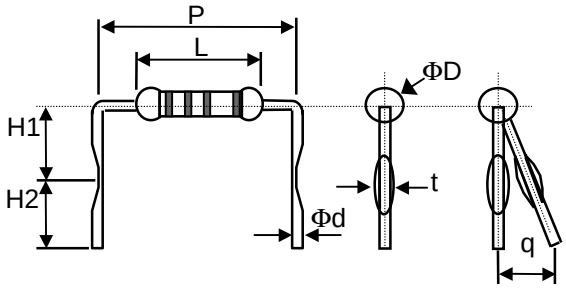
1.	Light Resistance:	Measured at 10 lux with standard light A (2854K-color temperature) and 2hr.Preillumination at 400-600 lux prior testing.
2.	Dark Resistance:	Measured at 10th seconds after closing 10 lux.
3.	Gamma characteristic:	Relative sensitivity (%) and given by $\gamma = \log(R10/R100)/\log(100/10) = \log(R10/R100)$ R10, R100: resistance at 10 lux and 100 lux.
4.	P max:	Max power dissipation at ambient temperature of 25℃.At higher ambient temperature, the maximum power permissible may be lowered.
5.	V max:	Max voltage in darkness that may be applied to the device continuously.
6.	Spectral peak:	Spectral sensitivity of photo resistors depends on the wavelength of light they are exposed to and in accordance with fig 2. The tolerance of spectral peak is ±50nm. Figure 5: Relative sensitivity (%)  Wavelength (nm)

RESISTOR FORMING TYPE AND DIMENSIONS

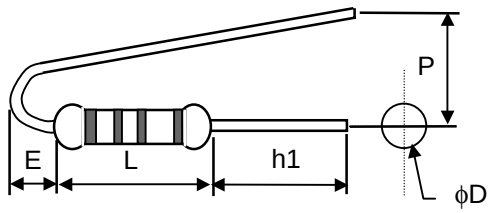
TAPE TYPE DIMENSIONS				
Type	T-26	T-52	T-63	T-73
A	26 ± 1	52 ± 1	63 ± 1.5	73 ± 1.5
B	5 ± 0.5	5 ± 0.5	10 ± 0.5	10 ± 0.5
C	5 ± 1	5 ± 1	5 ± 1	5 ± 1
D	Max 0.6	Max 0.6	Max 0.8	Max 0.8
E	Max 1.2	Max 1.2	Max 1.2	Max 1.2
F	6 ± 1	6 ± 1	6 ±1	6 ± 1



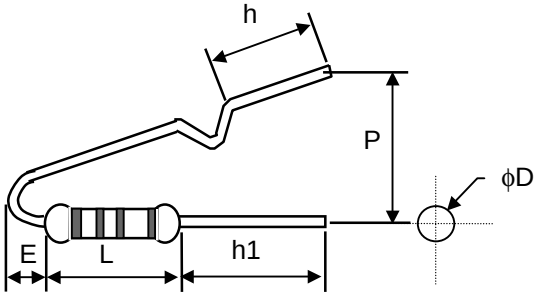
MB FORM DIMENSIONS TABLE								
Watts		D±0.5	L±1	P±1	H_1±1	H_2±0.5	d±0.5	t±0.2
1/2W	1WS	3	9	12.5	10.5	4	0.6	1.2
1W	2WS	4	11	15	10.5	4	0.8	1.25
2W	3WS	5	15	20	10.5	4	0.8	1.25
3W	5WS	6	17	25	10.5	4	0.8	1.25
5W	-	8	24	30	14	6.5	0.8	1.25



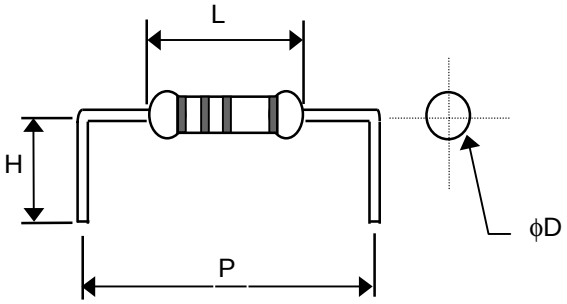
F FORM DIMENSIONS TABLE						
Watts		Dimensions				
		ϕ D±0.5	L±1.0	P±2.0	E Max	h_1±1.0
1/2W	1WS	3	9	6	3.5	5
1W	2WS	4	11	6	3.5	5
2W	3WS	5	15	6	3.5	5
3W	5WS	6	17	6	3.5	5



FK FORM DIMENSIONS TABLE							
Watts		Dimensions					
		ϕ D±0.5	L±1.0	P±2.0	E Max	h_1±1.0	h_2 Max
1/2W	1WS	3	9	6	3.5	5	4
1W	2WS	4	11	6	3.5	5	4
2W	3WS	5	15	6	3.5	5	4
3W	5WS	6	17	6	3.5	5	4



M FORM DIMENSIONS TABLE					
Watts		Dimensions			
		ϕ D±0.5	L±1.0	P±2.0	H±1.0
1/8W	1/4WS	1.5	3.2	6	10
1/4W	1/2WS	2.3	6	10	10
1/2W	1WS	3	9	12.5	10
1W	2WS	4	11	15	10
2W	3WS	5	15	20	10
3W	5WS	6	17	25	10
5W		8	24	30	20



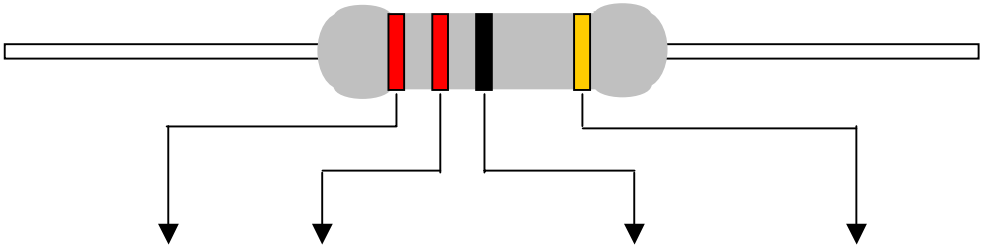
RESISTOR COLOR CODE SYSTEM

Token resistor color code system applies to carbon film resistors, metal oxide film resistors, fusible resistors, precision metal film resistors, and wire wound resistors (cylindrical with enlarged ends) of the axial lead type. This system is employed for resistors when the surface area is not sufficient to print the resistance value for the past time. At present, Token resistor color code system is applying for autoimmunization. The first three bands closest to one end of the resistor are used to determine the resistance. The fourth band represents the tolerance of the resistor. Additional information can be obtained from the first band. Generally, If an additional fifth band is black, the resistor is wire wound resistor. If an additional fifth band is white, the resistor is fusible resistor. If only one black band in the center, the resistor is called zero ohm resistor. The colors of the first two bands represent the numerical value of the resistor. The third band represents the power-of-10 multiplier.

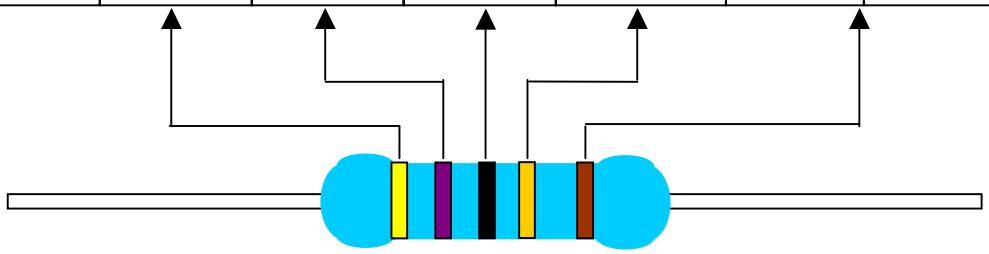
HOW TO READ THE REISISTOR CODE

First find the tolerance band, it will typically be gold (5%) and sometimes silver (10%). Starting from the other end, identify the first band - write down the number associated with that color; in this case Red is 2. Now 'read' the next color, here it is red so write down a 2 next to the two. (You should have '22' so far.) Now read the third or 'multiplier' band and write down that number of 1. In this example, the 'multiplier' band is Black so we get 22Ω. If the 'multiplier' band is Gold move the decimal point one to the left. If the 'multiplier' band is Silver move the decimal point two places to the left.

TOKEN RESISTOR COLOR CODE



COLOR	1ST BAND	2ND BAND	3TH BAND	MULTIPLIER	TOLERANCE	
BLACK	0	0	0	1		
BROWN	1	1	1	10	± 1%	F
RED	2	2	2	100	± 2%	G
	3	3	3	1K		
YELLOW	4	4	4	10K		
GREEN	5	5	5	100K	± 0.5%	D
BLUE	6	6	6	1M	± 0.25%	C
VIOLET	7		7	10M	± 0.10%	B
GREY	8	8	8		± 0.05%	A
WHITE	9	9	9			
GOLD				0.1	± 5%	J
SILVER				0.01	± 10%	K
PLAIN					± 20%	M



RESISTANCE TOLERANCE									
Symbol	**A**	**B**	**C**	**D**	**F**	**G**	**J**	**K**	**M**
Resistance tolerance	**±0.05%**	**±0.1%**	**±0.25%**	**±0.5%**	**±1%**	**±2%**	**±5%**	**±10%**	**±20%**

SIGNIFICANT FIGURES OF NOMINAL RESISTANCE

E-6 RESISTANCE TOLERANCE (±20%)

10	15	22	33	47	68						

E-12 RESISTANCE TOLERANCE (±10%)

10	12	15	18	22	27	33	39	47	56	68	82

E-24 RESISTANCE TOLERANCE (±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

E-96 RESISTANCE TOLERANCE (±1%)

10.0	10.2	10.5	10.7	11. 0	11. 3	11. 5	11. 8	12.1	12.4	12.7	13.0
13.3	13.7	14.0	14.3	14.7	15.0	15.4	15.8	16.2	16.5	16.9	17.4
17.8	18.2	18.7	19.1	19.6	20.0	20.5	21.0	21.5	22.1	22.6	23.2
23.7	24.3	24.9	25.5	26.1	26.7	27.4	28.0	28.7	29.4	30.1	30.9
31.6	32.4	33.2	34.0	34.8	35.7	36.5	37.4	38.3	39.2	40.2	41.2
42.2	43.2	44.2	45.3	46.4	47.5	48.7	49.9	51.1	52.3	53.6	54.9
56.2	57.6	59.0	60.4	61.9	63.4	64.9	66.5	68.1	69.8	71.5	73.2
75.0	76.8	78.7	80.6	82.5	84.5	86.6	88.7	90.9	93.1	95.3	97.6

E-192 RESISTANCE TOLERANCE (±0.1%; ±0.25%; ±0.5%)

10.0	10.1	10.2	10.4	10.5	10.6	10.7	10.9	11. 0	11. 1	11. 3	11. 4
11. 5	11. 7	11. 8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	13.0	13.2
13.3	13.5	13.7	13.8	14.0	14.2	14.3	14.5	14.7	14.9	15.0	15.2
15.4	15.6	15.8	16.0	16.2	16.4	16.5	16.7	16.9	17.2	17.4	17.6
17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.6	19.8	20.0	20.3
20.5	20.8	21.0	21.3	21.5	21.8	22.1	22.3	22.6	22.9	23.2	23.4
23.7	24.0	24.3	24.6	24.9	25.2	25.5	25.8	26.1	26.4	26.7	27.1
27.4	27.7	28.0	28.4	28.7	29.1	29.4	29.8	30.1	30.5	30.9	31.2
31.6	32.0	32.4	32.8	33.2	33.6	34.0	34.4	34.8	35.2	35.7	36.1
36.5	37.0	37.4	37.9	38.3	38.8	39.2	39.7	40.2	40.7	41.2	41.7
42.2	42.7	43.2	43.7	44.2	44.8	45.3	45.9	46.4	47.0	47.5	48.1
48.7	49.3	49.9	50.5	51.1	51.7	52.3	53.0	53.6	54.2	54.9	55.6
56.2	56.9	57.6	58.3	59.0	59.7	60.4	61.2	61.9	62.6	63.4	64.2
64.9	65.7	66.5	67.3	68.1	69.0	69.8	70.6	71.5	72.3	73.2	74.1
75.0	75.9	76.8	77.7	78.7	79.6	80.6	81.6	82.5	83.5	84.5	85.6
86.6	87.6	88.7	89.8	90.9	92.0	93.1	94.2	95.3	96.5	97.6	98.8

TOKEN RESISTOR GLOSSARY

RATED POWER

The maximum value of power, which can be continuously loaded to a resistor at a rated ambient temperature. Please confirm beforehand that there is such a case in a network resistor that rated power per package as well as per element is specified.

RATED VOLTAGE

The maximum value of D.C. voltage or A.C. voltage (commercial frequency effective value) capable of being applied continuously to a resistor at the rated ambient temperature. Rated voltage shall be calculated from the following formula. However, it shall not exceed the maximum working voltage.

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

CRITICAL RESISTANCE VALUE

The maximum nominal resistance value at which the rated power can be loaded without exceeding the maximum working voltage. The rated voltage is equal to the maximum working voltage in the critical resistance value.

MAXIMUM WORKING VOLTAGE

The maximum value of D.C. voltage or A.C. voltage (commercial frequency effective value) capable of being applied continuously to a resistor or a resistor element. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

MAXIMUM OVERLOAD VOLTAGE

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. The maximum value of voltage capable of being applied to a resistor for five seconds in the overload test. (JIS C 5201- 1 4.13) Typically the applied voltage in the short time overload test shall be 2.5 times larger than the rated voltage. However, it shall not exceed the maximum overload voltage.

DIELECTRIC WITHSTANDING VOLTAGE

A.C. voltage (commercial frequency effective value) that can be applied to a designated spot between the electrode and the outer coating for a minute in the dielectric withstanding voltage test. (JIS C 5201- 1 4.7)

RATED AMBIENT TEMPERATURE

The maximum ambient temperature at which a resistor is capable of being used continuously with the prescribed rated load (power). The rated ambient temperature refers to the temperature around the resistor inside the equipment, not to the air- temperature outside the equipment.

DERATING CURVE

The curve that expresses the relation between the ambient temperature and the maximum value of continuously loadable power at its temperature, which is generally expressed in percentage.

TEMPERATURE COEFFICIENT OF RESISTANCE (T.C.R.)

The rate of change in resistance value per 1 °C in the prescribed temperature within the range of resistor operating temperature shall be expressed in the following formula:

$$\text{T.C.R. (ppm/°C)} = \frac{R-R_0}{R_0} \times \frac{1}{T-T_0} \times 10^6$$

R：Measured resistance (Ω) at T °C

R_0：Measured resistance (Ω)at T_0°C

T：Measured test temperature (°C)

T_0：Measured base temperature (°C)

PRECAUTIONS IN USE OF FIXED RESISTORS

FIXED RESISTORS IN GENERAL

When an ambient temperature exceeds a rated ambient temperature, resistors shall be applied on the derating curve by derating the load power.
General resistors are not combustion- resistant and are likely to emit, flame, gas, smoke, red heat, etc. under overloads. Flame retardant resistors generally emit smoke and red heat in a certain power and over but do not emit fire or flame.
When resistors are shielded or coated with resin etc., stress from the storage heat and the resin are applied to the resistors. So, performance and reliability of resistors should be checked well before use.
When a voltage higher than rated is applied in a short time (single pulse, repeated pulses, surge, etc.), it does not necessarily ensure safety that an effective wattage is not higher than a rated wattage. Then consult with us with your specified pulse wave shape
Resistors shall be used in a condition causing no dew condensation.
Keep temperature from rising by choosing a resistor with a higher rated capacity; do not use a component having the exact load value required. For considerations of safety in extended period applications, the resistor rating should be more than four times higher than the actual wattage involved, but never use a resistor at less than 25% of its rated power.
In applications where resistors are subject to intermittent current surges and spikes, be sure in advance that the components selected are capable of withstanding brief durations of increased load.
Do not exceed the recommended rated load. Resistors must used within the rated voltage range to prevent the shortening of service life and/or failure of the wound resistance elements
Minimum load: Resistors must be utilized at 1/10 or more of the rated voltage to prevent poor conductance due to oxidation build-up.
For basic particulars for cautions, refer to EIAJ Technical Report RCR- 2121 "Guidance for care note on fixed resistors".

METAL OXIDE FILM RESISTORS

All resistors manufactured by Token Electric Co., Ltd. comply with the U.S. UL-94 non-flammability test, Class V-0, a continuous combustion period of zero seconds.
Smoke emitted from non-flammable resistors on initial use in powered circuits is a normal phenomenon and the component can be safely utilized.
Never use organic solvents to clean non-flammable resistors.
Non-flammable resistors cannot be utilized in oil.
Non-flammable resistor cannot be used in high frequency machinery because of the inductance produced by the windings.
A suitable type of resistor must be selected. Contact us for details.
Although the hardness exceeds that of a 3H pencil lead, do not nick the resistor coating with screwdrivers or other pointed objects
Avoid touching non-flammable resistors in operation; the surface temperature ranges from approximately 350°C to 400°C when utilized at the full rated value. Maintaining a surface temperature of 200°C or less will extend resistor service life.
Less resistant against external shocks than ordinary resistors due to special flame retardant coating. So, never give shocks or vibrations on the resistors. Also never damage them by picking up the coated films with pliers, tweezers, etc. After cleaning, no external power should be put on the coated films before they are well dried.

WIRE WOUND RESISTORS

When being used in AC circuits, some wire wound structures give inductance ingredients or parasitic capacity, so they may cause unusual phenomena such as oscillations etc.
Quorum deviations of other components should be carefully taken into account for use.
Application and Placement: Wire-wound resistors use different gauges of wire as resistance elements. Sometimes the gauge is extremely thin (finer than a strand of human hair) and very susceptible to breakage in environments containing salts, ash, dust and corrosives. Avoid utilization in such environments.
Do not install in dusty areas because the accumulation will cause shorts and poor conductance.

FUSING RESISTORS

When using, it shall be made sure that the overload conditions at unusual moments lie within the fusing territory.
Consult with us in advance when overloaded higher than the rated voltage under an ordinary situation since such an overload may store up damages on resistors.
Use at the maximum open- circuit voltage or lower as an arc phenomenon may arise when high voltage is applied again after fusing by an over current.
Consult with us for the maximum open- circuit voltage because it varies with type and resistance.

CHIP NETWORKS

Care should be taken to the fact that slipping out of position during mounting may increase to cause solder bridges.
As chip networks receive mechanical stress easier than chip resistors, take care so that no strong mechanical stress is given during and after the mounting.
An incorrect solder volume increases stress on resistors and may result in cracks or performance defects. Be careful to avoid too much or too little soldered volume

PRECAUTIONS IN USE

The types and the specifications in this catalog are typical ones. Before use, please make sure of specifications and precautions in use with the contents of specifications for supply or ask our sales offices for the specifications.

PARTICULARS COMMON TO ALL KINDS OF PRODUCT TYPES

APPLICATIONS

When components are used for special applications requiring high reliability (life maintenance equipment, atomic energy, airplanes, artificial satellites, etc.), contact us beforehand. Also make sure to evaluate and verify the components in a state that they are mounted on actual equipment.

SOLDERING

Soldering shall be performed within the specified temperature, time and number of times for each component. If the components are heated to high temperature for a long time, the colors and characteristics may change, and disconnection may occur.
After soldering, keep the component from stress until it is cooled down.
After soldering, be sure not to give any mechanical stress on the terminal section by warping of the printed board, etc.

INSERTION AND MOUNTING

The coating is covered to ensure the performance of components. Do not give any damages or excessive impacts on the products with pliers or pinsetter, or improper adjustment of an automatic mounter.
They may cause characteristic changes, disconnection, crack, etc.
Do not use the components dropped at the time of mounting or ones removed from the printed boards.
Make sure to avoid heat radiation generated by other heated components.
In case boards are sealed by molding or coated after mounting components, consult us beforehand.
Take care not to have electrostatics applied to the components when assembling.

RESISTANCE TO PULSE

If the components are used in circuits where pulse wave current (single pulse, repeated pulse) or surge current flows, consult us beforehand.
Also note that it is necessary to check with actual circuits considering dispersion of the tolerance values of the other components.

STORAGE

The components should be kept away from high temperature, high humidity, direct sunlight, heat, corrosive gas (brimstone, chlorine, acid, alkali, etc.)
Please inquire us about the storage term of products.

CLEANING

Be careful not to leave ionic substances contained in solder flux after washing the flux.
Especially when non-washing- soldering, water washing or water- soluble detergent is used, it is essential to confirm reliability of the components before use.

GENERAL

For basic particulars for cautions, refer to EIAJ Technical Report RCR-1001 “Safety application guide for electronic parts ”.

PARTICULARS COMMON TO CHIP COMPONENTS

Warping of printed boards, which is caused by heat, gives stress directly to components when boards are cooled down. Be careful of the following particulars:
The arrangement of electrodes of chip components should go along with the fiber direction (vertical direction) of printed boards.
When printed boards are divided after soldering, proper positioning of the components is required in order to avoid any stress caused by warping, bending, etc. of the boards.
Be sure to design the same size of pads both on left and right sides.
If far different sizes of components are mixed on a board, take care of the positioning of the components.

PARTICULARS COMMON TO DISCRETE COMPONENTS

To avoid mechanical force to components, pay attention to following the particulars:
Be careful not to create resonance by vibration.
The bodies of the discrete components should be free from twisting or bending.
The bodies of the large components should be firmly fixed.
When the lead wires need to be bent, try to make larger radius of curve in order to avoid excessive force at the foot of the terminals.
When cutting or clinching the lead wires on the mounter, be careful not to apply excessive forces to them.