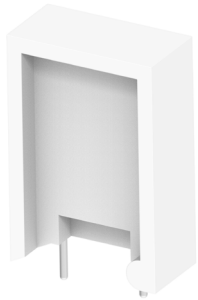
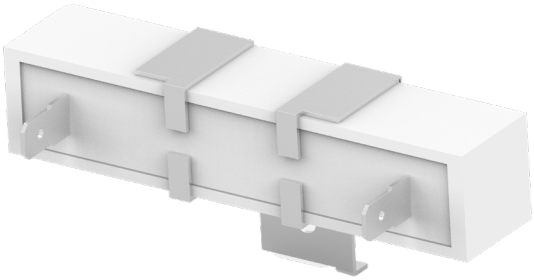
CEMENT HOUSED HIGH POWER RESISTOR

TYPE SQ SERIES

INTRODUCTION

TE Connectivity (TE)'s flexible range of power wire wound resistors either have wire or power oxide film elements. The SQ series resistors are wound or deposited on a fine non-alkali ceramic core then embodied in a ceramic case and sealed with an inorganic silica filler. This design provides a resistor with high insulation resistance, low surface temperature, excellent Temperature co-efficient of resistance (TCR), and entirely flameproof construction. These resistors are excellently suited to a range of areas where low cost, and efficient thermal performance are important design criteria. Metal film cores adjusted by laser spiral are used where the resistor value is above that suited to wire. Similar performance is obtained although short time overload is slightly derated.





FEATURES

- Choice of styles
- Bracketed types available
- Operating temperature -55°C to +155°C
- Wide value range
- Stable TCR 300PPM/°C
- Custom designs welcome
- Inorganic flame resistant construction
- Certain models are now AEC-Q200 qualified
- Pulse withstand model is now available

ELECTRICAL CHARACTERISTICS

Characteristic	Specification		Test Method
	Wire Wound	Power Film	
Short time overload	10 times rated power for 5 seconds	5 times rated power for 5 seconds	± 2%
Rated load	Rated power for 30 minutes		± 1%
Voltage withstand	1000V AC 1 minute SQMB10W - 3000v 2 seconds		No change
Insulation resistance	500V megger		1000 Meg
Max. overload voltage	2 times max. working voltage		
Operating temperature range	-55°C ~ 155°C		
Resistance temp. coefficient	±300PPM <1R ±600PPM		

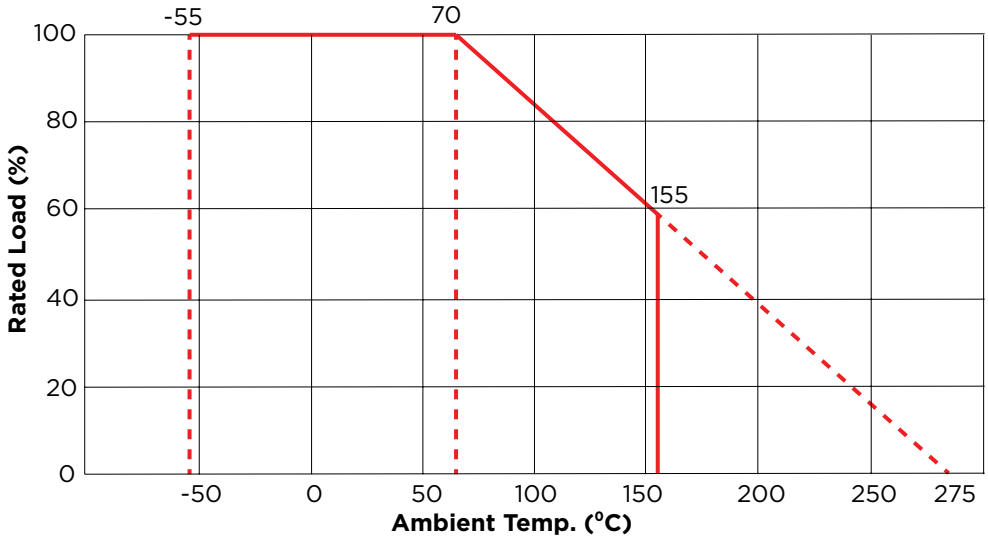
Power Rating	2W	3W	5W	7W	10W	15W	20W, 25W	50W	60W
Max working voltage	150V	350V	350V	500V	750V	1000V	1000V	1000V	1000V

ENVIRONMENTAL CHARACTERISTICS

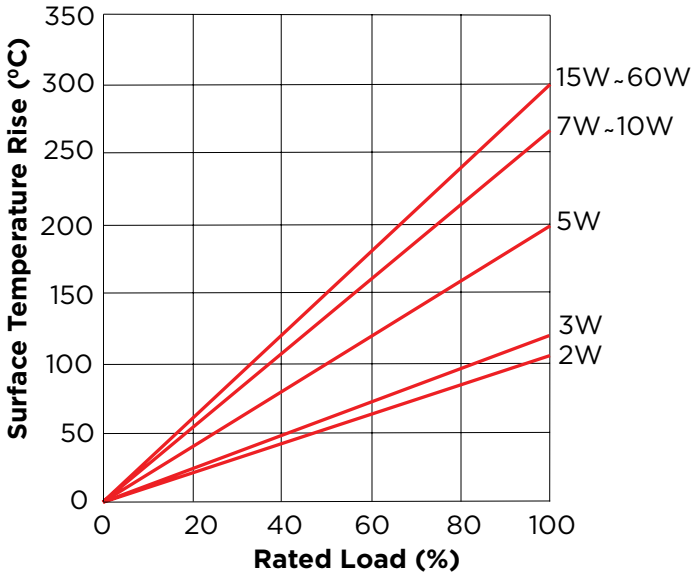
Characteristics	Standards	Test Methods (JIS C 5201)
Temperature cycle	± 1%	-55°C ~ 155°C
Load life	± 5%	70°C on-off cycle for 1000 hours
Load life in humidity	± 5%	40°C 95% RH on-off cycle 1000 hours
Terminal strength	No evidence of mechanical damage	**Direct load** A static load of 4.5kgs is to be gradually applied onto the terminal for 10 secs **Twist Test** With the resistor body secured, the terminal leads shall be bent through 90° at a point of about 6mm from the body of the resistor. At a point 1.2±0.4mm away from the bend, turn clockwise 360°, perpendicular to the resistor axis, at a speed of 5 secs per turn. Then make the same turn counter clockwise. Repeat process 2 times.
Solderability	95% min. coverage	235 ± 5°C for 2 secs
Resistance to soldering heat	± 1%	270 ± 5°C for 10±1 secs or 350± 10°C for 5±0.5 secs, leave at room temp for 1 hour
Incombustibility	No flame	16 times rated wattage for 5 minutes

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve.

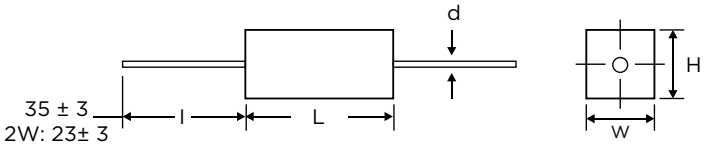


SURFACE TEMPERATURE RISE



TYPE SQP – HORIZONTAL

Dimensions in mm



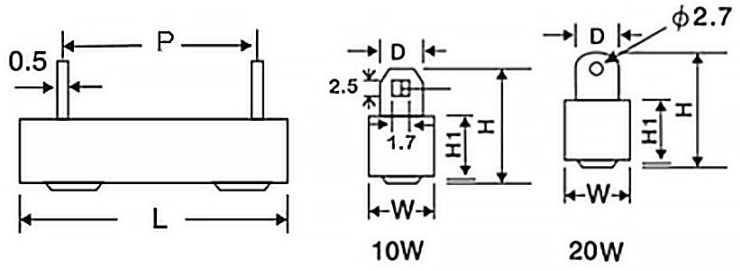
	Dimensions (mm)					Resistance Range (Ω)	
	W ± 1	H ± 1	L ± 1.5	d ± 0.1	l ± 3	Wire Wound	Power Film
2W	7	7	18	0.65	23	R10 – 100R	101R – 10K
3W	8	8	22	0.8	35	R10 – 150R	151R – 33K
5W	10	9	22	0.8	35	R10 – 150R	151R – 50K
7W	10	9	35	0.8	35	R10 – 430R	431R – 50K
10W	10	9	48	0.8	35	R10 – 4700R	471R – 50K
15W	12.5	11.5	48	0.8	35	R50 – 600R	601R – 150K
20W-25W	14	13.5	60	0.8	35	R50 – 1K	1.1K – 150K

Rated Continuous Working Voltage (RCWV)

RCWV: √(Rated Power x Resistance value) or Maximum Working Voltage listed above whichever is lower.

TYPE SQH – HORIZONTAL WITH SOLDER TAGS

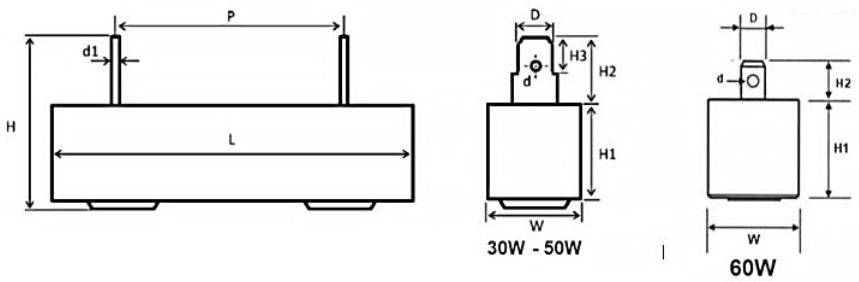
Dimensions in mm



	Dimensions (mm)						Resistance Range (Ω)	
	W ± 1	H ± 1	L ± 1.5	P ± 1	H1 ± 1	D ± 0.5	Wire Wound	Power Film
10W	10	21	48	32	9	5	R50 – 600R	601R – 50K
20W	14.5	24	60	42	13.5	6	1R0 – 1K	1.1K – 150K

TYPE SQH – HORIZONTAL WITH FASTON CONNECTORS

Dimensions in mm



	Dimensions (mm)										Resistance Range (Ω)
	W	H	L	P	H1 ± 1	D	H2 ± 0.5	H3 ± 0.2	d	d1	Wire Wound
30W*	19 ± 1	32.5 ± 2	75 ± 1.5	55 ± 2	19	6.4 ± 0.1	12	8	1.6 ± 0.1	0.8 ± 0.1	1R0– 2K5
40W*	19 ± 1	32.5 ± 2	90 ± 1.5	67 ± 2	19	6.4 ± 0.1	13	8	1.6 ± 0.1	0.8 ± 0.1	1R0– 3K
50W*	19 ± 1	32.5 ± 2	90 ± 1.5	67 ± 2	19	6.4 ± 0.1	13	8	1.6 ± 0.1	0.8 ± 0.1	1R0– 3K
60W	18 ± 1	28 ± 1.5	90 ± 1	70 ± 1	19	6.35 ± 0.25	9	-	1.65 ± 0.2	0.8 ± 0.03	1R0– 3K

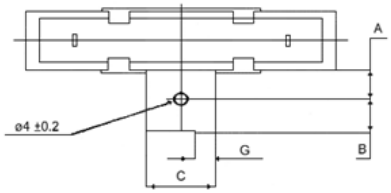
* AEC-Q200 Qualified

AEC-Q200 TESTING

Characteristics	Standards	Test Methods (JIS C 5201)
High temperature exposure	≦±1%	125°C±3°C, 1000 hours without load (MIL-STD-202 Method 108)
Temperature cycling	≦±1%	-55±3°C 30mins, normal temp 3 mins, 155±3°C 30mins normal temp 3mins 1000 cycles. Measurement 24 hours after test conclusion (JESD22 Method JA-104)
Moisture resistance	≦±0.5%	85°C±2°C, 85%RH, 1000 hours without load (MIL-STD-202 Method 106)
Biased humidity	≦±5%	10% rated power, 85°C/85%RH, 1000hr. measurement at 24 hours after test conclusion (MIL-STD-202 Method 103)
Operational life	≦±5%	Steady state TA=125°C at rated power. Measurement 24 hours after test conclusion (MIL-STD-202 Method 108)
Physical dimension		Verify physical dimensions to the applicable device detail specification (JESD22 Method JB-100)
Resistance to solvents	No abnormality on appearance	Add aqueous wash chemical – OKEM clean or equivalent. Do not use banned solvents (MIL-STD-202 Method 215)
Vibration	≦±0.5%	5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000 Hz (MIL-STD-202 Method 204)
Resistance to soldering heat	≦±1%	Solder bath temp., 270±10°C for 10s (MIL-STD-202 Method 210)
Mechanical shock test	≦±0.5%	Pulse form: Half sine / acceleration: 100g ±20% Peak duration: 6ms±30% / number of shocks 3per direction Shock direction: ±X, ±Y, ±Z / total shocks: 18 (MIL-STD-202 Method 213)
ESD	≦±0.5%	Cd=150pF Rd=2000Ω Voltage: 6KV (AEC-Q200-002)
Solderability	Coverage ≧ 95%	Solder bath temp.:235±5°C Dipping time:2s (J-STD-002)
Resistance temperature coefficient	±300ppm/°C	Natural resistance change per temperature degree centigrade $\{(R1-R2)/R1(T2-T1)\} \times 10^6$ (PPM/°C) R1 resistance value at room temperature (T1) R2 resistance value at room temperature +100°C (T2) Test pattern: room temp. (T1), room temp. +100°C(T2)

TYPE SQB – HORIZONTAL WITH BRACKET

Drawing below shows bracket dimensions only, resistor dimensions are as shown for SQH above.
Dimensions in mm

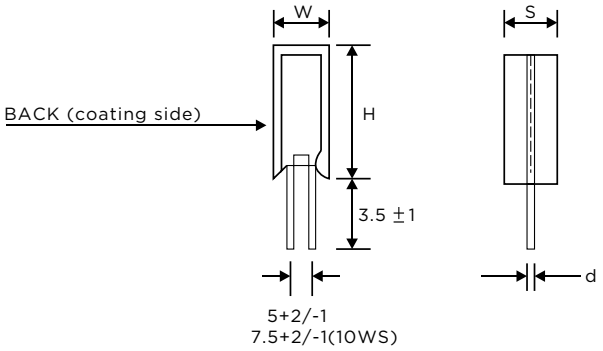


	Dimensions (mm)				Resistance Range (Ω)	
	A ± 0.5	B ± 0.5	C ± 0.5	G ± 0.5	Wire Wound	Power Film
10W	8	5	12	3	R50 – 600R	601R – 50K
20W	8	5.5	12	3	1R0 – 1K	1.1K – 150K
30W*	10.5	8	18	3.5	1R0 – 2K	-
40W*	10.5	8	18	3.5	1R0 – 2K	-
50W*	10.5	8	18	3.5	1R0 – 3K	-
60W	10.5	8	18	3.5	1R0 – 2K	-

* AEC-Q200 Qualified

TYPE SQM – VERTICAL

Dimensions in mm

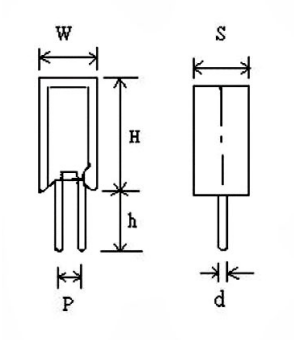


	Dimensions (mm)				Resistance Range (Ω)	
	H ± 1.5	W ± 1	S ± 1	d ± 0.1	Wire Wound	Power Film
2W	20	11	7	0.65	R10 – 82R	83R – 10K
3W	25	12	8	0.8	R10 – 150R	151R – 50K
5W	25	13	9	0.8	R10 – 150R	151R – 50K
7W	39	13	9	0.8	R10 – 430R	431R – 50K
10WS	35	16	12	0.8	R10 – 300R	301R – 100K
10W	52	13	9	0.8	R10 – 470R	471R – 75K

N.B. Custom design versions in wire at low tolerances, better T.C.R., and higher ohmic values are available to special order. Please enquire.

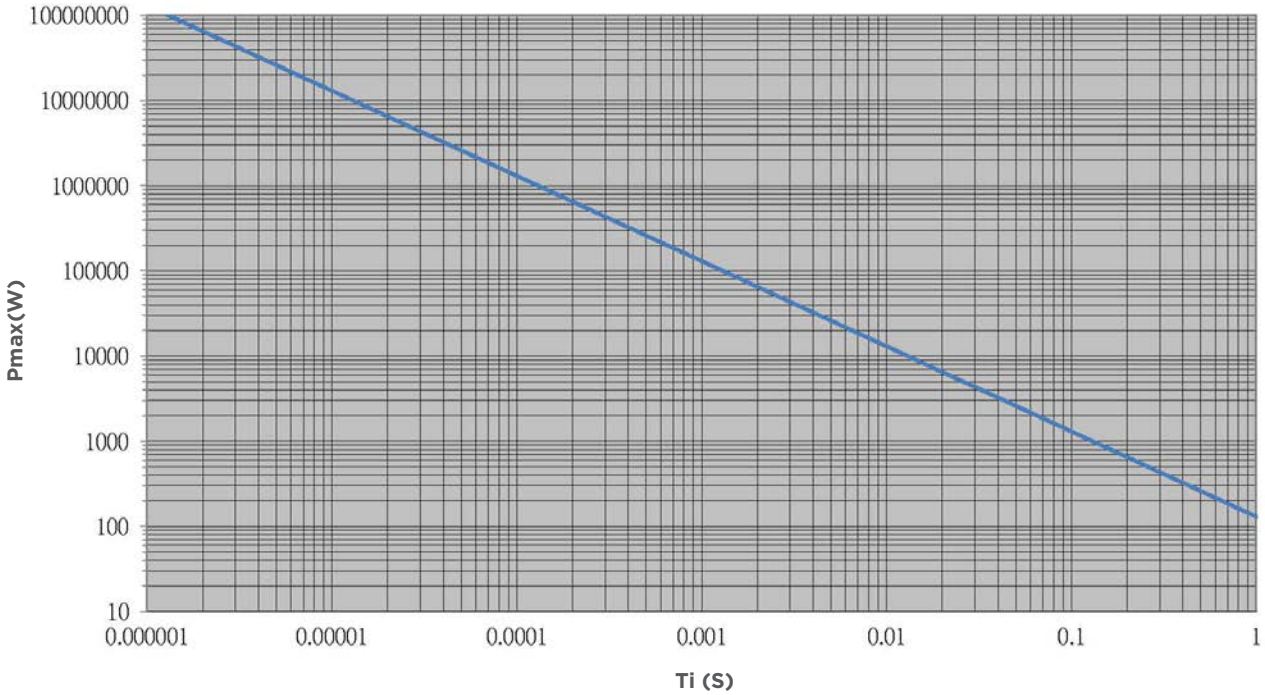
TYPE SQMB – VERTICAL PULSE WITHSTAND

Dimensions in mm



	Dimension (mm)						Resistance Range (Ω)
	H ± 1	W ± 1	S ± 0.3	d ± 0.1	P ± 0.5	h ± 0.5	Wire Wound
10W	30	20	10	1	11	3.5	R10 – 2K4

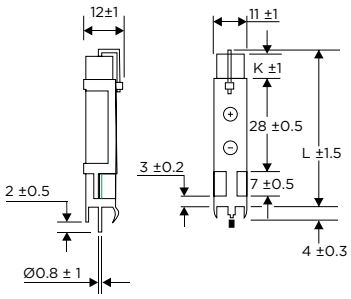
SQMB - PULSE PERFORMANCE

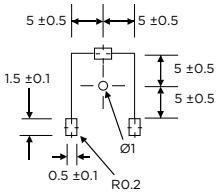


Maximum permissible peak pulse power (Pmax) as a function of pulse duration (Ti)

TYPE SPS – VERICAL MOUNTING WITH STABILISING BRACKET

Dimensions in mm



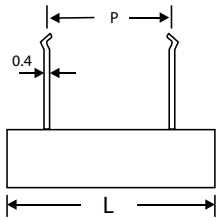


Suggested PCB Layout Plan

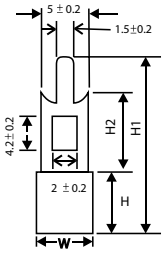
	Dimensions (mm)		Resistance Range (Ω)	
	L ± 1.5	K ± 1	Wire Wound	Power Film
7W	46	7.5	R10 – 430R	431R – 50K
10W	60	20	R10 – 470R	471R – 50K

TYPE SQZ – HORIZONTAL PLUGGABLE

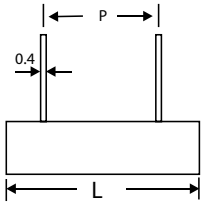
Dimensions in mm



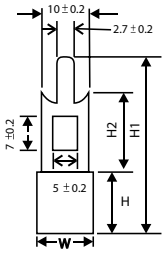
5W~15W



5W~15W



20W • 25W

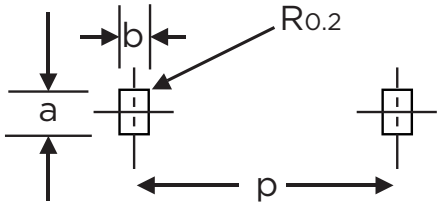


20W • 25W

	Dimensions (mm)						Resistance Range (Ω)	
	W ± 1	H ± 1	L ± 1.5	P ± 1.5	H1 ± 1	H2 ± 1	Wire Wound	Power Film
5W	10	10	28	15	25	10	R10 – 130R	131R – 50K
7W	10	10	36	20	25	10	R10 – 430R	431R – 50K
10W	10	9	48	32	25	10	R20 – 470R	471R – 50K
15W	12.5	12	48	32	27	10	1R0 – 600R	601R – 150K
20W-25W	15	13	60	42	32	15	1R0 – 1K0	1K01– 150K

TYPE SQZ – HORIZONTAL PLUGGABLE

	PCB Hole Dimensions (mm)		
	a	b	p
5W	2.0	0.8	15
7W	2.0	0.8	20
10W	2.0	0.8	32
15W	2.0	0.8	32
20W-25W	3.5	1.0	42



STORAGE CONDITIONS

The resistors with appropriate package would have a preservative duration of 1 year, under the following conditions.

T=5ºC ~ 35ºC

H=40% ~ 75%

ORDERING INFORMATION

Part Number

SQP W 20 1R0 J

Common Part

SQP	Horizontal Axial Type
SQZ	Horizontal Pluggable Type
SQM	Vertical Radial Type
SQMB	Vertical Radial (pulse) Type
SPS	Vertical Radial (with bracket) Type
SQH	Horizontal (solder tag / faston) Type
SQB	Horizontal (with bracket) Type

Element

W	Wire
R	Metal Film

Rated Power

2	2 Watts
3	3 Watts
5	5 Watts
etc...	

Resistance Tolerance

J	±5%
Other tolerances available on request	

Resistance Value

R10	0.1 ohm = 1 milliohm
1R0	1 ohm = 1000 milliohms
1K0	1K ohm = 1000 ohms
1M0	1Mohm = 1000000 ohms

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