SMD Wirewound Resistors - SW

FEATURES

RoHS compliant

- Resistance: 0.01 to 50kΩ
- High power to 4W
- Resistance tolerance to ±0.1% (Lower tolerances available on request)
- Low temperature coefficient
- Superior surge handling capability
- Reel packaging in embossed carrier tape
- Available in non-inductive (Ayrton-Perry) winding (Type SWN)

TECHNOLOGY

The resistor element is a resistive wire, which is wound in a single layer on a ceramic rod. Metal caps are pressed over the ends of the rod. The ends of the resistive wire and the leads are connected to the caps by welding. The leads are tinned for good soldering. The resistor is encapsulated with a molding compound and this encapsulation is resistant to most commonly used cleaning solvents, in accordance with MIL-STD-202, method 215 and IEC 60068-2-45.

QUICK REFERENCE DATA

Table 1. Quick reference data

Description	SW0	SW1	SW2	SW3	SW4
Resistance range	0.01Ω - 400Ω	0.01Ω - 1kΩ	0.01Ω - 15kΩ	0.005Ω - 25kΩ	0.01Ω - 50kΩ
Maximun dissipation at $T_{amb.}$ 70°C	0.5W	1W	2W	3W	4W
Limiting voltage	33V	58V	127V	150V	212V
Tolerances (1)	±0.1 to ±5%				
Temperature coefficient	0.1 - <1Ω: ±90ppm/°C				
	1 - 10Ω: ±50ppm/°C				
	>10Ω: ±20ppm/°C				
Operating temperature	-55°C to 275°C				
Stability $\Delta R/R_{max.}$ After:	Maximum resistance change				
Load life	1.0%				
Moisture resistance	1.0%				
Short time overload (5x rated power for 5s)	0.5%				

(1) Lower tolerances and TCR available on request.

Non-inductive type: divide maximum resistance by 2, multiply working voltage by 0.707.

MECHANICAL DATA

Figure 1. Mechanical data

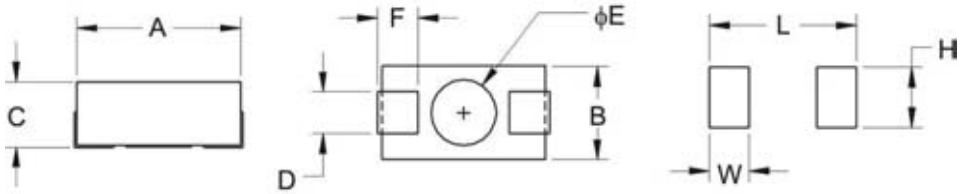


Table 2. Mechanical data

Type	A	B	C	Lead thickness	D	Stand off		F	Foot Print		
						ϕE	Ht		W	H	L
SW0	4.83 (0.190)	3.30 (0.130)	2.79 (0.110)	0.15 (0.006)	1.52 (0.060)	2.54 (0.100)	0.13 (0.005)	1.02 (0.040)	1.57 (0.062)	2.54 (0.100)	6.35 (0.250)
SW1	6.60 (0.260)	3.94 (0.155)	3.18 (0.125)	0.15 (0.006)	1.78 (0.070)	3.05 (0.120)	0.13 (0.005)	1.78 (0.070)	2.43 (0.096)	2.84 (0.112)	8.56 (0.337)
SW2	11.43 (0.450)	6.35 (0.250)	4.57 (0.180)	0.15 (0.006)	3.05 (0.120)	4.82 (0.190)	0.13 (0.005)	2.54 (0.100)	3.94 (0.155)	5.84 (0.230)	13.72 (0.540)
SW3	15.88 (0.625)	6.89 (0.270)	6.35 (0.250)	0.15 (0.006)	3.05 (0.120)	3.81 (0.150)	0.13 (0.005)	3.43 (0.135)	5.08 (0.200)	3.81 (0.150)	17.78 (0.700)
SW4	20.83 (0.820)	7.49 (0.295)	7.11 (0.280)	0.15 (0.006)	3.81 (0.150)	6.22 (0.245)	0.13 (0.005)	1.78 (0.070)	5.59 (0.220)	6.35 (0.250)	22.86 (0.900)

Dimensions unless specified in mm (inches)

ELECTRICAL CHARACTERISTICS

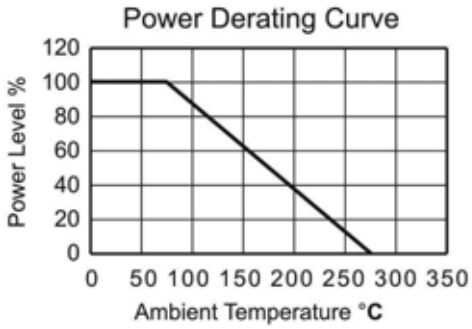


Figure 2. Maximum dissipation ($P_{max.}$) in percentage of rated power as a function of ambient temperature ($T_{amb.}$)

MARKING

Depending on product size and available space, products will be clearly marked with the following identifiers:

- Brand “PHX”
- Resistor type designation including the power rating, example “SW3”
- Nominal resistance, example “180Ω”
- Tolerance on the resistance, example “1%”

Example:
SW3, 180Ω, 1%

PHX SW3 **180Ω 1%**

ORDERING INFORMATION

The resistors have an ordering code with 9 or 10 digits. First 3 or 4 digits for product type and the subsequent digits indicate resistance value and tolerance.

Table 3. Ordering code

SW2N4K700C

Resistor type

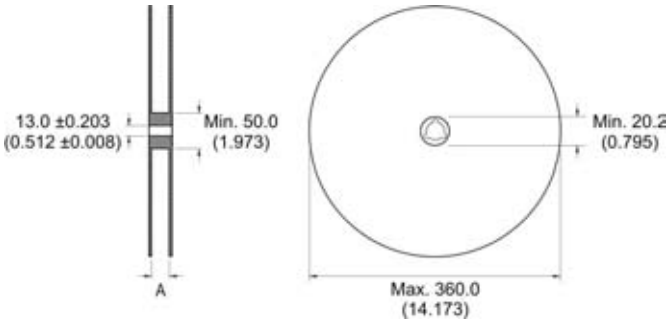
Insert “N” for non-inductive

Ohmic Value	5 digits	Tolerance (%)	
0.001Ω	0R001	±0.1	B
0.01Ω	0R010	±0.25	C
0.1Ω	0R100	±0.50	D
1Ω	1R000	±1	F
10Ω	10R00	±5	J
100Ω	100R0		
1kΩ	1K000		
10kΩ	10K00		

PACKAGING

Taped on Reel: in accordance with EIA-481-1, 2.

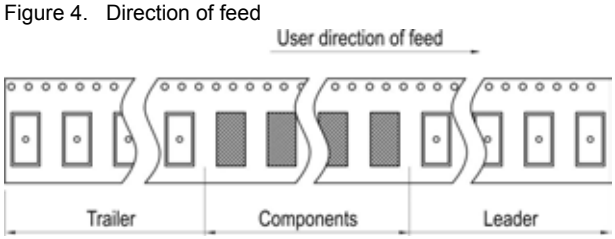
Figure 3. Taped on reel



Product	$A_{max.}$
SW0	13.3 (0.52)
SW1	16.5 (0.65)
SW2	25.4 (1.00)
SW3	33.0 (1.30)
SW4	33.0 (1.30)

Table 4. Dimensions unless specified in mm (inches)

Figure 4. Direction of feed

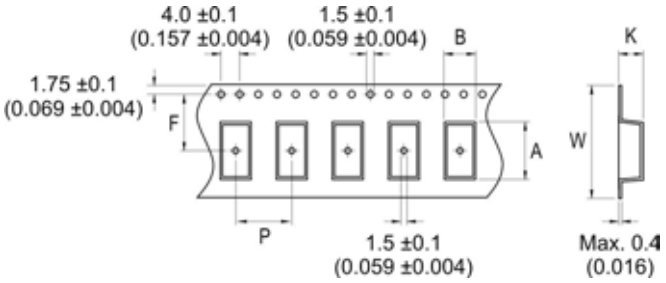


Trailer: shall be a leader of 230mm (9.06”) minimum which may consist of carrier and/or cover tape followed by a minimum of 160mm (6.30”) of carrier tape with sealed cover tape not to exceed 560mm (22.05”) combined total.

Leader: There shall be a minimum of 160mm (6.3”) of empty component pockets sealed with cover tape.

Tape Dimensions

Figure 5. Tape dimensions



PRODUCT	$A_{max.}$	$B_{max.}$	F ±0.10 (±0.004)	$K_{max.}$	P ±0.10 (±0.004)	W ±0.30 (±0.012)	QUANTITY pcs.
SW0	6.5 (0.255)	3.6 (0.140)	5.5 (0.217)	2.9 (0.115)	8.0 (0.315)	12.0 (0.472)	2000
SW1	7.4 (0.291)	4.2 (0.165)	7.5 (0.295)	3.9 (0.154)	8.0 (0.315)	16.0 (0.630)	2000
SW2	12.3 (0.485)	6.7 (0.265)	11.5 (0.453)	5.1 (0.200)	12.0 (0.472)	24.0 (0.945)	1000
SW3	17.6 (0.694)	9.5 (0.374)	14.2 (0.453)	9.4 (0.370)	16.0 (0.630)	32.0 (1.260)	750
SW4	22.2 (0.874)	11.8 (0.465)	14.2 (0.453)	11.0 (0.434)	16.0 (0.630)	32.0 (1.260)	500

Table 5. Dimensions unless specified in mm (inches)

TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with MIL-STD-202 publication that defines the test method standard for electronic and electrical component parts, covering environmental, physical, and electrical characteristics tests. The equivalent tests based on IEC 60115-1 are described for reference. In cases the test is not defined in the MIL publication, the test procedure is carried out only in accordance with IEC publication.
In some instances deviations from MIL or IEC applications were necessary for our specified procedure and requirements.

Table 6. Test and requirements

MIL-STD 202 TEST METHOD	IEC 60115-1 CLAUSE (reference)	TEST	PROCEDURE	REQUIREMENTS	
208	4.17	Solderability	age 60+5m, 5 to 10s at room temperature; immerse in Type R flux for 5 to 10s; leads immersed to within 0.05" of body for 5±0.5s in solder bath at 230±5°C; dip in clean isopropyl alcohol	examine under 10X microscope; at least 95% coverage, pinholes or voids are not concentrated and do not exceed 5% of total area	
215	4.29	Resistance to solvents	immerse for 1m in isopropyl alcohol (1 parts) and mineral spirits (3 parts); 3x brush for 10 strokes	No evidence of mechanical damage; markings shall remain legible	
107	4.19	Thermal shock	5 cycles, 30m at -65°C and 30m at +125°C; min 5 minutes between temperatures	No evidence of mechanical damage ΔR/R ±0.5% +0.05Ω	
304	4.8 [1]	Resistance temperature characteristic	between +25°C and +80°C	0.1 to < 1Ω	±90ppm/°C
				1 to 10Ω	±50ppm/°C
				> 10Ω	±20ppm/°C
				NOTE: less than	0.1Ω, consult factory
-	-	Low temperature storage	-55°C for 24h	no mechanical damage ΔR/R ±0.5% +0.005Ω	
-	4.13	Short time overload	Room temperature; 5XPn, 5s	no evidence of arcing, burning or charring: ΔR/R ±0.5% ±0.005Ω	
301	4.7	Dielectric withstanding voltage	atmospheric pressure: 1000V RMS, during 60s	no evidence of flashover, mechanical damage, arcing, or insulation breakdown	
302	4.6.1.1	Insulation resistance	100V DC after 1 minute	1MΩ minimum, dry	
106	-	Moisture resistance	10 Cycles; 24h, 25°C to 65°C, 90 to 98% RH; loaded with 1.0Pn	ΔR/R ±1.0%; no evidence of mechanical damage; 1000V dielectric withstand voltage, 100MΩ insulation resistance	
213	4.21	Shock (specified pulse)	test condition I; total of ten shocks in each of two mutually perpendicular planes	ΔR/R ±0.5% +0.005Ω	
108	4.8.16	Load life	1000h, 25 ±5°C, 1.0 Pn, 1.5h ON, 0.5h OFF	ΔR/R ±1.0% +0.05Ω	

[1] for ohmic values lower than 0,1Ω, the TCR is typically 150ppm/°C