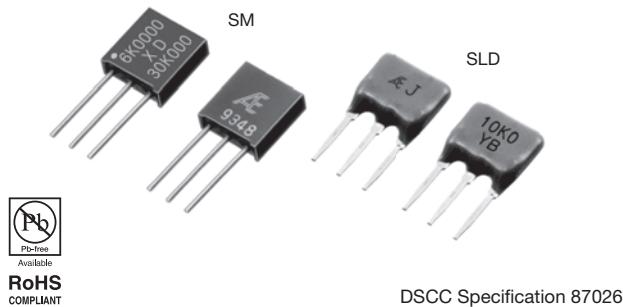


Ultra Precision Resistor 1-2-3 Network



COMPOSITION OF TYPE NUMBER

Example: $R_1=R_2$

SM 1X 10K00 BA

① ② ③ ④ ⑤ ⑥

Example: $R_1 \neq R_2$

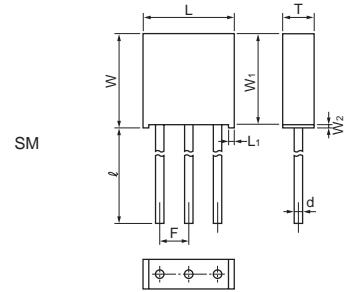
SLD 2X 1K000 / 10K00 BQ

① ② ③ ④ ⑤ ⑥

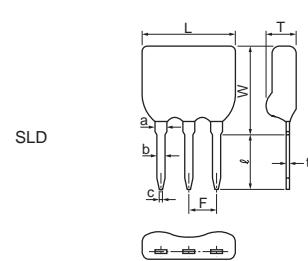
- ① Type
- ② Number of Values
- ③ TCR Absolute
- ④ Nominal Resistance Values
- ⑤ Resistance Tolerance (Absolute)
- ⑥ Resistance Tolerance (Matching)

Resistance value, in ohm, is expressed by a series of five characters, four of which represent significant digits. The fifth R or K is a dual-purpose letter that designates both the value range (R for ohmic; K for kilo-ohm) and the location of decimal point.

CONFIGURATION (DIMENSIONS IN mm)



Type	SM
L	7.7 ± 0.2
L ₁	1.0 max.
W	8.1 ± 0.2
W ₁	7.8 ± 0.2
W ₂	0.3 max.
T	2.6 ± 0.2
F	2.54 ± 0.25
l	10 ± 3
d	$\phi 0.65 \pm 0.05$



Type	SLD
L	7.5 ± 0.5
W	7.5 ± 0.5
T	2.2 ± 0.5
F	2.54 ± 0.25
l	5 ± 1
t	0.3 ± 0.05
a	1.0 ± 0.05
b	0.65 ± 0.05
c	0.4 ± 0.05

TCR, RESISTANCE RANGE, TOLERANCE, RATED POWER

Type	TCR (ppm/°C)		Resistance Range/Element (Ω)***	Resistance Tolerance (%)		Rated Power/Package (W)
	Absolute*	Tracking		Absolute*	Matching*	
SM	0 ± 5 (X)	See Table 1	50 to 30k	± 0.02 (Q)	± 0.01 (T)	0.3 at 125°C
	0 ± 2.5 (Y)			± 0.05 (A)	± 0.02 (Q)	
SLD	0 ± 5 (X)	See Table 1	50 to 100	± 0.1 (B)	± 0.05 (A)	0.25 at 70°C
	0 ± 2.5 (Y)		100 to 30k	± 0.5 (D)	± 0.1 (B)	

* Symbols parenthesized are for type number composition.

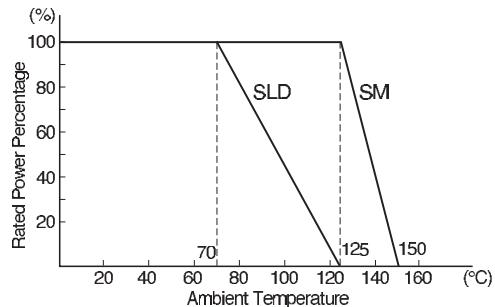
** -25°C to +125°C for SLD type.

*** Please contact us for the availability.

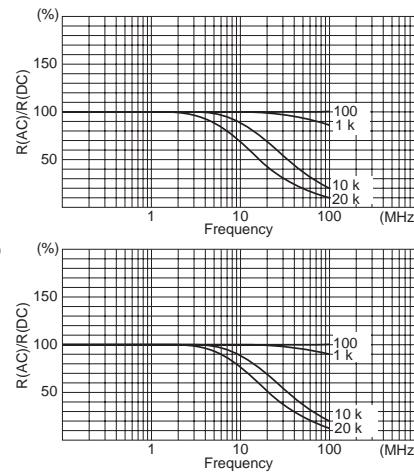
TABLE 1. TCR TRACKING IS SUBJECT TO RESISTANCE RATIO

Resistance Ratio	TCR Tracking (ppm/°C)
Resistance Ratio = 1	± 0.5
$1 < \text{Resistance Ratio} \leq 10$	± 1
$10 < \text{Resistance Ratio} \leq 100$	± 2
$100 < \text{Resistance Ratio}$	± 3

POWER DERATING CURVE



FREQUENCY CHARACTERISTICS



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PERFORMANCE – SM

Parameters	Test Condition	ALPHA Specification		ALPHA Typical Test Data	
		ΔR	ΔRatio	ΔR	ΔRatio
Maximum Rated Operating Temperature Working Temperature Range		125°C		-65°C to +150°C	
Thermal Shock Overload	-65°C/30 min. ↔ +150°C/30 min., 5 cycles Rated Voltage x 2.5, 5 sec.	±0.02% ±0.02%	±0.01% ±0.01%	±0.005% ±0.0025%	±0.0025% ±0.001%
Solderability	245°C, 5 sec.	over 95% coverage		over 95% coverage	
Resistance to Solvents	① Isopropyl Alcohol + Mineral Spirits ② Water + Butyl Cellosolve + Monoethanolamine	no damage		no damage	
Low Temperature Storage and Operation Terminal Strength	-65°C, No Load, 24 hrs.—Rated Voltage, 45 min. 0.908 kg (2 pounds), 10 sec.	±0.05% ±0.02%	±0.02% ±0.01%	±0.0025% ±0.0025%	±0.001% ±0.001%
Dielectric Withstanding Voltage	Atmo. Pres.: AC 300V, 1 min. Baro. Pres.: 1066 Pa; AC 200V, 1 min.	±0.02%	±0.01%	±0.0025%	±0.001%
Insulation Resistance	DC 500V, 2 min.	over 10,000 MΩ		over 10,000 MΩ	
Resistance to Soldering Heat	350°C, 3 sec.	±0.02%	±0.01%	±0.0025%	±0.001%
Moisture Resistance	+65°C to -10°C, 90% RH to 98% RH, Rated Voltage, 10 cycles (240 hrs.)	±0.05% ±0.05%	±0.02% ±0.02%	±0.02% ±0.02%	±0.01% ±0.01%
Shock	100G, 6 ms, Sawtooth Wave, X, Y, Z, each 10 shocks	±0.01%	±0.005%	±0.0025%	±0.001%
Vibration, High Frequency	20G, 10 Hz to 2,000 Hz to 10 Hz, 20 min., X, Y, Z, each 2.5 hrs.	±0.02%	±0.01%	±0.0025%	±0.001%
Life	125°C, Rated Power, 1.5 hr. – ON, 0.5 hr. – OFF, 2,000 hrs.	±0.05%	±0.02%	±0.015%	±0.005%
Storage Life	15°C to 35°C, 15% RH to 75% RH, No Load, 10,000 hrs.	±0.005%	±0.0025%	±0.0025%	±0.0015%
High Temperature Exposure	150°C, No Load, 2,000 hrs.	±0.05%	±0.02%	±0.015%	±0.005%
Current Noise		-32 dB 0.0005%/V 1.0 μV/°C		-42 dB 0.00003%/V 1.0 μV/°C	
Voltage Coefficient					
Thermal EMF					

PERFORMANCE – SLD

Parameters	Test Condition	ALPHA Specification		ALPHA Typical Test Data	
		ΔR	ΔRatio	ΔR	ΔRatio
Maximum Rated Operating Temperature Working Temperature Range		70°C		-25°C to +125°C	
Temperature Cycling Overload	-25°C/30 min., Room Temperature/5 min., 125°C/30 min., 5 cycles Rated Voltage x 2.5, 5 sec.	±0.05% ±0.05%	±0.01% ±0.01%	±0.01% ±0.0025%	±0.005% ±0.001%
Solderability	235°C, 2 sec.	over 75% coverage		over 75% coverage	
Resistance to Solvents	Isopropyl Alcohol	no damage		no damage	
Low Temperature Operation Terminal Strength	-25°C, No Load, 2 hrs. 0.908 kg (2 pounds), 10 sec.	±0.05% ±0.05%	±0.01% ±0.01%	±0.0025% ±0.0025%	±0.001% ±0.001%
Dielectric Withstanding Voltage	Atmo. Pres.: AC 300V, 1 min.	±0.03%	±0.01%	±0.0025%	±0.001%
Insulation Resistance	DC 100V, 1 min.	over 10,000 MΩ		over 10,000 MΩ	
Resistance to Soldering Heat	350°C, 3 sec.	±0.03%	±0.01%	±0.0025%	±0.001%
Moisture Resistance	+65°C to -10°C, 90% RH to 98% RH, Rated Voltage, 10 cycles (240 hrs.)	±0.1%	±0.05%	±0.03%	±0.01%
Shock	50G, 11 ms, Half-Sine Wave, X, Y, Z, each 3 shocks	±0.03%	±0.01%	±0.005%	±0.001%
Vibration	20G, 10 Hz to 55 Hz to 10 Hz, 1 min., X, Y, Z, each 2 hrs.	±0.03%	±0.01%	±0.005%	±0.001%
Life (Rated Load)	70°C, Rated Power, 1.5 hr. – ON, 0.5 hr. – OFF, 1,000 hrs.	±0.1%	±0.05%	±0.01%	±0.005%
Life (Moisture Load)	40°C 90% RH to 95% RH, Rated Power 1.5 hrs – ON, 0.5 hr. – OFF, 1,000 hrs.	±0.05%	±0.01%	±0.01%	±0.005%
Storage Life	15°C to 35°C, 15% RH to 75% RH, No Load, 10,000 hrs	±0.02%	±0.01%	±0.005%	±0.0025%
High Temperature Exposure	125°C, No Load, 1,000 hrs.	±0.05%	±0.01%	±0.01%	±0.005%

EXAMPLE OF APPLICATION

An application of type SM/SLD (input/feedback resistors for amplifiers) Because the input and the feedback resistors are incorporated into one single element, amplification is not affected by temperature range.

