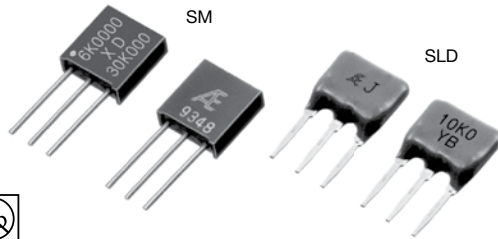


## Ultra Precision Resistor 1-2-3 Network

RoHS  
COMPLIANT

DSCC Specification 87026

## COMPOSITION OF TYPE NUMBER

Example:  $R_1 \neq R_2$ 

**SM 1X 10K00 B A**

① ② ③ ④ ⑤ ⑥

Example:  $R_1 \neq R_2$ 

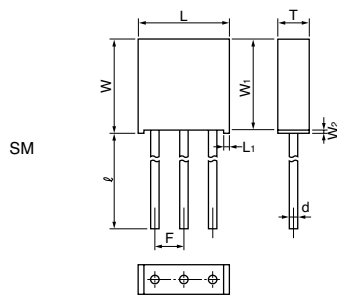
**SLD 2X 1K000 / 10K00 B Q**

① ② ③ ④ ⑤ ⑥

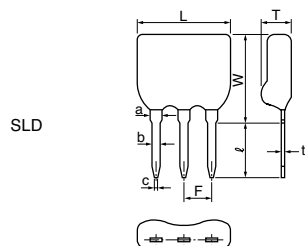
- ① Type
- ② Number of Values
- ③ TCR Absolute
- ④ Nominal Resistance Values
- ⑤ Resistance Tolerance (Absolute)
- ⑥ Resistance Tolerance (Matching)

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    |
| L1   | 1.0 max.   |
| W    | 8.1±0.2    |
| W1   | 7.8±0.2    |
| W2   | 0.3 max.   |
| T    | 2.6±0.2    |
| F    | 2.54±0.25  |
| l    | 10±3       |
| d    | φ0.65±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)<br>-55°C to +125°C |             | Resistance Range/<br>Element (Ω)** | Resistance Tolerance (%)           |                                                 | Rated Power/<br>Package (W) |
|------|---------------------------------|-------------|------------------------------------|------------------------------------|-------------------------------------------------|-----------------------------|
|      | Absolute*                       | Tracking    |                                    | Absolute*                          | Matching*                                       |                             |
| SM   | 0±5 (X)<br>0±2.5 (Y)            | See Table 1 | 50 to 30k                          | ±0.02 (Q)<br>±0.05 (A)<br>±0.1 (B) | ±0.01 (T)<br>±0.02 (Q)<br>±0.05 (A)<br>±0.1 (B) | 0.3<br>at 125°C             |
| SLD  | 0±5 (X)<br>0±2.5 (Y)            | See Table 1 | 50 to 100                          | ±0.1 (B)<br>±0.5 (D)               | ±0.05 (A)<br>±0.1 (B)                           | 0.25<br>at 70°C             |
|      |                                 |             | 100 to 30k                         | ±0.05 (A)<br>±0.1 (B)              | ±0.02 (Q)<br>±0.05 (A)<br>±0.1 (B)              |                             |

\* Symbols parenthesized are for type number composition.

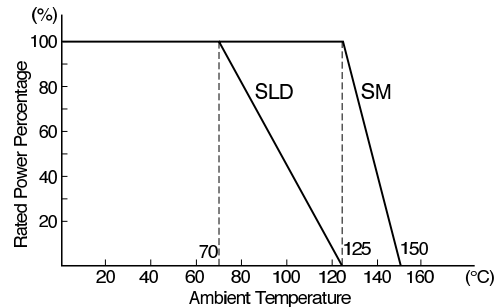
\*\* -25°C to +125°C for SLD type.

\*\*\* Please contact us for the availability.

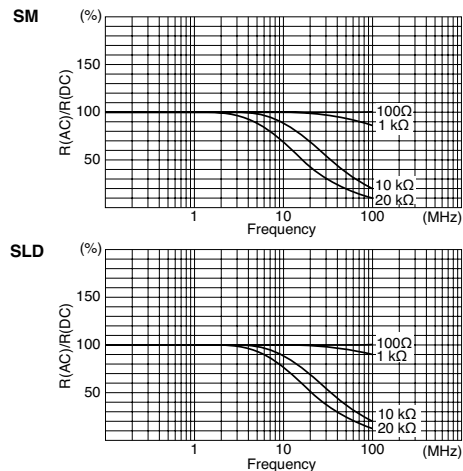
TABLE 1.  
TCR TRACKING IS SUBJECT TO RESISTANCE RATIO

| Resistance Ratio            | TCR Tracking (ppm/°C) |
|-----------------------------|-----------------------|
| Resistance Ratio = 1        | ±0.5                  |
| 1 < Resistance Ratio ≤ 10   | ±1                    |
| 10 < Resistance Ratio ≤ 100 | ±2                    |
| 100 < Resistance Ratio      | ±3                    |

## POWER DERATING CURVE



## FREQUENCY CHARACTERISTICS



| PERFORMANCE – SM                      |                                                                                              |                              |                              |                                  |                                 |
|---------------------------------------|----------------------------------------------------------------------------------------------|------------------------------|------------------------------|----------------------------------|---------------------------------|
| Parameters                            | Test Condition                                                                               | ALPHA Specification          |                              | ALPHA Typical Test Data          |                                 |
|                                       |                                                                                              | $\Delta R$                   | $\Delta Ratio$               | $\Delta R$                       | $\Delta Ratio$                  |
| Maximum Rated Operating Temperature   |                                                                                              | 125°C                        |                              |                                  |                                 |
| Working Temperature Range             |                                                                                              | -65°C to +150°C              |                              |                                  |                                 |
| Thermal Shock Overload                | -65°C/30 min. $\leftrightarrow$ +150°C/30 min., 5 cycles<br>Rated Voltage x 2.5, 5 sec.      | $\pm 0.02\%$<br>$\pm 0.02\%$ | $\pm 0.01\%$<br>$\pm 0.01\%$ | $\pm 0.005\%$<br>$\pm 0.0025\%$  | $\pm 0.0025\%$<br>$\pm 0.001\%$ |
| Solderability                         | 245°C, 5 sec.                                                                                | over 95% coverage            |                              | over 95% coverage                |                                 |
| Resistance to Solvents                | ① Isopropyl Alcohol + Mineral Spirits<br>② Water + Butyl Cellosolve + Monoethanolamine       | no damage                    |                              | no damage                        |                                 |
| Low Temperature Storage and Operation | -65°C, No Load, 24 hrs. $\rightarrow$ Rated Voltage, 45 min.<br>0.908 kg (2 pounds), 10 sec. | $\pm 0.05\%$<br>$\pm 0.02\%$ | $\pm 0.02\%$<br>$\pm 0.01\%$ | $\pm 0.0025\%$<br>$\pm 0.0025\%$ | $\pm 0.001\%$<br>$\pm 0.001\%$  |
| Terminal Strength                     |                                                                                              | over 10,000 M $\Omega$       |                              | over 10,000 M $\Omega$           |                                 |
| Dielectric Withstanding Voltage       | Atmo. Pres.: AC 300V, 1 min. Baro. Pres. 8 mHg; AC 200V, 1 min.<br>DC 500V, 2 min.           | $\pm 0.02\%$                 | $\pm 0.01\%$                 | $\pm 0.0025\%$                   | $\pm 0.001\%$                   |
| Insulation Resistance                 |                                                                                              | over 10,000 M $\Omega$       |                              | over 10,000 M $\Omega$           |                                 |
| Resistance to Soldering Heat          | 350°C, 3 sec.                                                                                | $\pm 0.02\%$                 | $\pm 0.01\%$                 | $\pm 0.0025\%$                   | $\pm 0.001\%$                   |
| Moisture Resistance                   | +65°C to -10°C, 90% RH to 98% RH, Rated Voltage, 10 cycles (240 hrs.)                        | $\pm 0.05\%$                 | $\pm 0.02\%$                 | $\pm 0.02\%$                     | $\pm 0.01\%$                    |
| Shock                                 | 100G, 6 ms, Sawtooth Wave, X, Y, Z, each 10 shocks                                           | $\pm 0.01\%$                 | $\pm 0.005\%$                | $\pm 0.0025\%$                   | $\pm 0.001\%$                   |
| Vibration, High Frequency             | 20G, 10 Hz to 2,000 Hz to 10 Hz, 20 min., X, Y, Z, each 2.5 hrs.                             | $\pm 0.02\%$                 | $\pm 0.01\%$                 | $\pm 0.0025\%$                   | $\pm 0.001\%$                   |
| Life                                  | 125°C, Rated Power, 1.5 hr. – ON, 0.5 hr. – OFF, 2,000 hrs.                                  | $\pm 0.05\%$                 | $\pm 0.02\%$                 | $\pm 0.015\%$                    | $\pm 0.005\%$                   |
| Storage Life                          | 15°C to 35°C, 15% RH to 75% RH, No Load, 10,000 hrs.                                         | $\pm 0.005\%$                | $\pm 0.0025\%$               | $\pm 0.0025\%$                   | $\pm 0.0015\%$                  |
| High Temperature Exposure             | 150°C, No Load, 2,000 hrs.                                                                   | $\pm 0.05\%$                 | $\pm 0.02\%$                 | $\pm 0.015\%$                    | $\pm 0.005\%$                   |
| Current Noise                         |                                                                                              | -32 dB                       |                              | -42 dB                           |                                 |
| Voltage Coefficient                   |                                                                                              | 0.0005%/V                    |                              | 0.00003%/V                       |                                 |
| Thermal EMF                           |                                                                                              | 1.0 $\mu V/^{\circ}C$        |                              | 1.0 $\mu V/^{\circ}C$            |                                 |

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

## 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.

