

# Two-Terminal, Metal Type Current Shunt Resistor

## SSA Series

**HF** **RoHS** **Pb**


### Description

Littelfuse SSA Series is a two-terminal, ultra-low resistance shunt resistor. The SSA shunt resistors are of superior quality and are best suited for applications including power hybrid applications, frequency converters, power modules, and communication systems.

### Features & Benefits

- English case sizes 2512, 3921, and 5931
- Resistance from 0.2 mΩ~4 mΩ
- Power up to 15 W
- Tolerance down to  $\pm 1.0\%$
- Temperature Coefficient of Resistance (TCR) down to  $\pm 50$  ppm/°C
- Small size
- High voltage
- Halogen-free, lead-free and RoHS compliant

### Additional Information



Resources



Accessories



Samples

### Application

- Hybrid Power Application
- Frequency Converter
- Power Module
- Communication System

### Electrical Specifications

| Part number     | Size |       | Resistance Value |             | Power (70°C) | Power (100°C) | TCR (ppm/°C) | Standard package Qty |
|-----------------|------|-------|------------------|-------------|--------------|---------------|--------------|----------------------|
|                 | inch | mm    | Ro (mΩ)          | Rt (%)      | W            | W             |              |                      |
| SSA2512L0M20FPR | 2512 | 6432  | 0.2              | $\pm 1.0\%$ | 6            | 4             | $\pm 200$    | 2000                 |
| SSA2512L0M25FPR | 2512 | 6432  | 0.25             | $\pm 1.0\%$ | 5            | 3             | $\pm 175$    | 2000                 |
| SSA2512L0M30FPR | 2512 | 6432  | 0.3              | $\pm 1.0\%$ | 5            | 4             | $\pm 175$    | 2000                 |
| SSA2512L0M50FWR | 2512 | 6432  | 0.5              | $\pm 1.0\%$ | 6            | 4             | $\pm 150$    | 3000                 |
| SSA2512LR001FWR | 2512 | 6432  | 1                | $\pm 1.0\%$ | 6            | 4             | $\pm 100$    | 3000                 |
| SSA2512LR002FWR | 2512 | 6432  | 2                | $\pm 1.0\%$ | 6            | 4             | $\pm 50$     | 3000                 |
| SSA2512LR003FWR | 2512 | 6432  | 3                | $\pm 1.0\%$ | 4            | 3             | $\pm 50$     | 3000                 |
| SSA2512LR004FWR | 2512 | 6432  | 4                | $\pm 1.0\%$ | 4            | 2             | $\pm 50$     | 3000                 |
| SSA2512L0M20JPR | 2512 | 6432  | 0.2              | $\pm 5.0\%$ | 6            | 4             | $\pm 200$    | 2000                 |
| SSA2512L0M25JPR | 2512 | 6432  | 0.25             | $\pm 5.0\%$ | 5            | 3             | $\pm 175$    | 2000                 |
| SSA2512L0M30JPR | 2512 | 6432  | 0.3              | $\pm 5.0\%$ | 5            | 4             | $\pm 175$    | 2000                 |
| SSA2512L0M50JWR | 2512 | 6432  | 0.5              | $\pm 5.0\%$ | 6            | 4             | $\pm 150$    | 3000                 |
| SSA2512LR001JWR | 2512 | 6432  | 1                | $\pm 5.0\%$ | 6            | 4             | $\pm 100$    | 3000                 |
| SSA2512LR002JWR | 2512 | 6432  | 2                | $\pm 5.0\%$ | 6            | 4             | $\pm 50$     | 3000                 |
| SSA2512LR003JWR | 2512 | 6432  | 3                | $\pm 5.0\%$ | 4            | 3             | $\pm 50$     | 3000                 |
| SSA2512LR004JWR | 2512 | 6432  | 4                | $\pm 5.0\%$ | 4            | 2             | $\pm 50$     | 3000                 |
| SSA3921L0M20FWR | 3921 | 50110 | 0.2              | $\pm 1.0\%$ | 9            | 5             | $\pm 150$    | 3000                 |
| SSA3921L0M30FWR | 3921 | 50110 | 0.3              | $\pm 1.0\%$ | 10           | 5             | $\pm 150$    | 3000                 |
| SSA3921L0M50FWR | 3921 | 50110 | 0.5              | $\pm 1.0\%$ | 9            | 5             | $\pm 70$     | 3000                 |
| SSA3921L0M75FWR | 3921 | 50110 | 0.75             | $\pm 1.0\%$ | 8            | 5             | $\pm 70$     | 3000                 |
| SSA3921LR001FWR | 3921 | 50110 | 1                | $\pm 1.0\%$ | 7            | 4             | $\pm 50$     | 3000                 |
| SSA3921LR002FWR | 3921 | 50110 | 2                | $\pm 1.0\%$ | 6            | 4             | $\pm 50$     | 3000                 |
| SSA3921LR003FWR | 3921 | 50110 | 3                | $\pm 1.0\%$ | 6            | 3             | $\pm 50$     | 3000                 |
| SSA3921LR004FWR | 3921 | 50110 | 4                | $\pm 1.0\%$ | 5            | 2,5           | $\pm 50$     | 3000                 |
| SSA3921L0M20JWR | 3921 | 50110 | 0.2              | $\pm 5.0\%$ | 9            | 5             | $\pm 150$    | 3000                 |
| SSA3921L0M30JWR | 3921 | 50110 | 0.3              | $\pm 5.0\%$ | 10           | 5             | $\pm 150$    | 3000                 |
| SSA3921L0M50JWR | 3921 | 50110 | 0.5              | $\pm 5.0\%$ | 9            | 5             | $\pm 70$     | 3000                 |
| SSA3921L0M75JWR | 3921 | 50110 | 0.75             | $\pm 5.0\%$ | 8            | 5             | $\pm 70$     | 3000                 |

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### Electrical Specifications

| Part number     | Size |       | Resistance Value |        | Power (70°C) | Power (100°C) | TCR (ppm/°C) | Standard package Qty |
|-----------------|------|-------|------------------|--------|--------------|---------------|--------------|----------------------|
|                 | inch | mm    | Ro (mΩ)          | Rt (%) | W            | W             |              |                      |
| SSA3921LR001JWR | 3921 | 50110 | 1                | ±5.0%  | 7            | 4             | ±50          | 3000                 |
| SSA3921LR002JWR | 3921 | 50110 | 2                | ±5.0%  | 6            | 4             | ±50          | 3000                 |
| SSA3921LR003JWR | 3921 | 50110 | 3                | ±5.0%  | 6            | 3             | ±50          | 3000                 |
| SSA5931L0M20FDR | 5931 | 75150 | 0.2              | ±1.0%  | 15           | 10            | ±125         | 1500                 |
| SSA5931L0M30FDR | 5931 | 75150 | 0.3              | ±1.0%  | 10           | 7             | ±100         | 1500                 |
| SSA5931L0M50FDR | 5931 | 75150 | 0.5              | ±1.0%  | 8            | 6             | ±100         | 1500                 |
| SSA5931L0M70FDR | 5931 | 75150 | 0.7              | ±1.0%  | 7            | 4             | ±100         | 1500                 |
| SSA5931L0M75FDR | 5931 | 75150 | 0.75             | ±1.0%  | 7            | 4             | ±100         | 1500                 |
| SSA5931LR001FDR | 5931 | 75150 | 1                | ±1.0%  | 10           | 7             | ±50          | 1500                 |
| SSA5931LR002FDR | 5931 | 75150 | 2                | ±1.0%  | 8            | 6             | ±50          | 1500                 |
| SSA5931LR003FDR | 5931 | 75150 | 3                | ±1.0%  | 7            | 4             | ±50          | 1500                 |
| SSA5931L0M20JDR | 5931 | 75150 | 0.2              | ±5.0%  | 15           | 10            | ±125         | 1500                 |
| SSA5931L0M30JDR | 5931 | 75150 | 0.3              | ±5.0%  | 10           | 7             | ±100         | 1500                 |
| SSA5931L0M50JDR | 5931 | 75150 | 0.5              | ±5.0%  | 8            | 6             | ±100         | 1500                 |
| SSA5931L0M70JDR | 5931 | 75150 | 0.7              | ±5.0%  | 7            | 4             | ±100         | 1500                 |
| SSA5931L0M75JDR | 5931 | 75150 | 0.75             | ±5.0%  | 7            | 4             | ±100         | 1500                 |
| SSA5931LR001JDR | 5931 | 75150 | 1                | ±5.0%  | 10           | 7             | ±50          | 1500                 |
| SSA5931LR002JDR | 5931 | 75150 | 2                | ±5.0%  | 8            | 6             | ±50          | 1500                 |
| SSA5931LR003JDR | 5931 | 75150 | 3                | ±5.0%  | 7            | 4             | ±50          | 1500                 |

### Storage / Environment Conditions

Products should be stored under the following environmental conditions.

|                                   |                             |
|-----------------------------------|-----------------------------|
| <b>Temperature:</b>               | +5 to +35 °C                |
| <b>Humidity:</b>                  | 45 to 85% relative humidity |
| <b>Moisture Sensitivity Level</b> | 1, J-STD-020                |

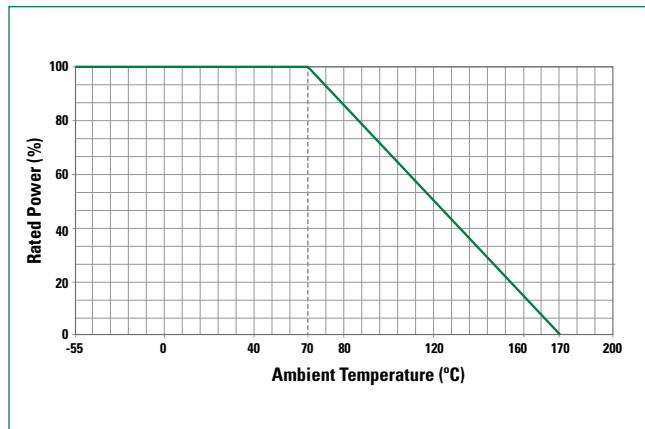
Do not keep products in environments where they may be subject to particulate contamination or harmful gases such as sulfuric acid or hydrogen chloride as it may cause oxidation on electrodes, resulting poor solderability.

Products should be stored in a space that does not expose to high temperatures, vibration, or direct sunlight.

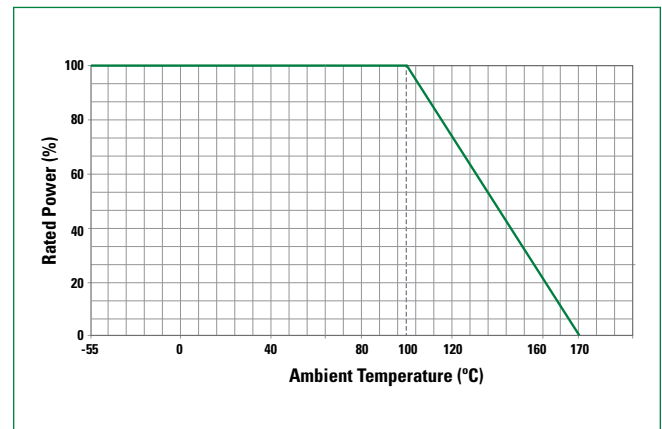
Products should be stored in the original airtight packaging until use.

### Temperature De-rating Curves

Terminal Temperature at 70°C



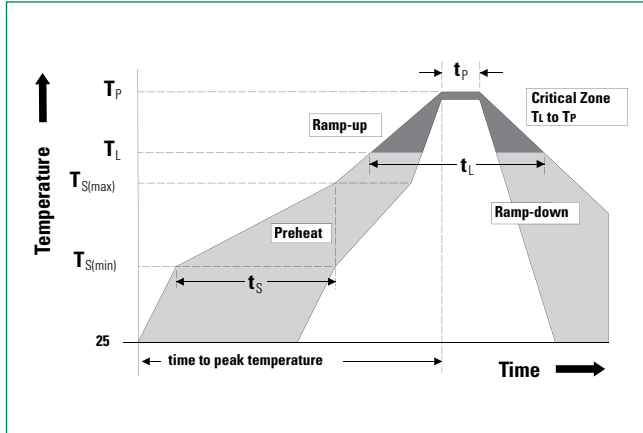
Terminal Temperature at 100°C



# Two-Terminal, Metal Type Current Shunt Resistor

## SSA Series

### Soldering Parameters—Wave Soldering



|                                                                           |                                                                  |                    |
|---------------------------------------------------------------------------|------------------------------------------------------------------|--------------------|
| <b>Profile Feature</b>                                                    |                                                                  | Pb-Free Assembly   |
| <b>Average Ramp-Up Rate (<math>T_{S(max)}</math> to <math>T_p</math>)</b> |                                                                  | 3 °C / second Max. |
| <b>Preheat</b>                                                            | <b>Temperature Minimum (<math>T_{S(min)}</math>)</b>             | 150 °C             |
|                                                                           | <b>Temperature Maximum (<math>T_{S(max)}</math>)</b>             | 200 °C             |
|                                                                           | <b>Time (<math>T_{S(min)}</math> to <math>T_{S(max)}</math>)</b> | 60–180 seconds     |
| <b>Time maintained above</b>                                              | <b>Temperature Minimum (<math>T_l</math>)</b>                    | 217 °C             |
|                                                                           | <b>Time (<math>t_l</math>)</b>                                   | 60–150 seconds     |
| <b>Peak Temperature (<math>T_p</math>)</b>                                |                                                                  | 260 +0 °C          |
| <b>Time within 5 °C of Actual Peak Temperature (<math>t_p</math>)</b>     |                                                                  | 20–40 seconds      |
| <b>Ramp-Down Rate</b>                                                     |                                                                  | 6 °C / second Max. |
| <b>Time 25 °C to Peak Temperature</b>                                     |                                                                  | 8 minutes Max.     |

### Reliability Specifications

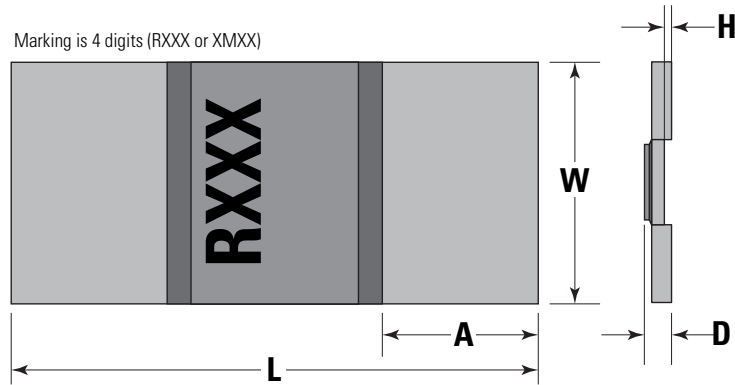
| Test                                                                     | Procedure                                                                                                                                                                  | Specifications                                          |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| <b>Resistance Data</b>                                                   | Resistance data at 25 °C                                                                                                                                                   | Must meet datasheet requirements                        |
| <b>TCR Data</b>                                                          | Tested at 25 °C and 125 °C $TCR = (R_b - R_a) / R_a \times 1 / (T_b - T_a) \times 10^6$                                                                                    | Must meet datasheet requirements                        |
| <b>Dimensional Data</b>                                                  | Measure all dimensions specified in datasheet                                                                                                                              | Must meet datasheet requirements                        |
| <b>Short Time Overload</b><br>JIS-C-5201, 4.13                           | Applied voltage: 2.5X rated voltage.<br>Test duration: 5 seconds                                                                                                           | ±1.0%                                                   |
| <b>Operational Life</b><br>MIL-STD-202, Method 108                       | Condition D Steady State $T_A = 125$ °C at rated power<br>Test period: 1,000 hours                                                                                         | ±1.0%                                                   |
| <b>Biased Humidity</b><br>MIL-STD-202, Method 103                        | Test Condition: 85 °C / 85% RH 10% of operating power<br>Test period: 1,000 hours                                                                                          | ±1.0%                                                   |
| <b>Temperature Cycle (Thermal Shock)</b><br>JESD22-A-104                 | Repeat 1,000 cycles as follows:<br>-55 °C (30 min.) / +155 °C (30 min.)<br>Transition time of 1 minute maximum                                                             | ±1.0%                                                   |
| <b>Resistance To Solder Heat</b><br>J-STD-020                            | One reflow cycle according to JEDEC J-STD-020, cool down then parts are immersed into a molten solder bath with a temperature of 260 °C for a period of $10 \pm 1$ seconds | Part must meet initial specifications following testing |
| <b>High Temperature Exposure</b><br>MIL-STD-202, Method 108, Condition D | Test Temperature: Maximum rated operational temperature<br>Test period: 1,000 hours<br>No electrical load                                                                  | ±1.0%                                                   |
| <b>Vibration</b><br>MIL-STD-202, Method 204, Condition B                 | Frequency: 10–2,000 Hz<br>Acceleration: 15G<br>Test Duration: 20 mins / 12 Cycles                                                                                          | ±1.0%                                                   |
| <b>Mechanical Shock</b><br>IEC60115-1, 4.21                              | Force: 100G<br>Test Duration: 6 ms                                                                                                                                         | ±1.0%                                                   |
| <b>Solderability</b><br>MIL-STD-202, Method 208H, Category 3             | Dipped into molten solder for $3 \pm 1$ seconds at 245 °C<br>Flux activity type R0                                                                                         | New solder coverage of 90% minimum                      |

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### Dimensions

All dimensions in mm

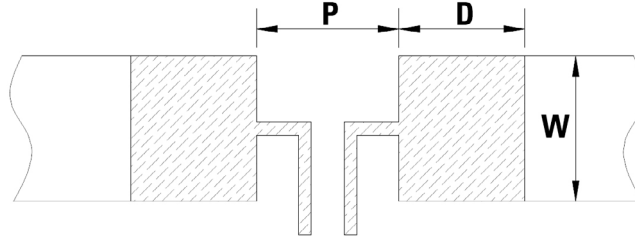


| Part Number | Resistance Value | W          | L          | H          | A          | D    |
|-------------|------------------|------------|------------|------------|------------|------|
| SSA2512     | 0.2mΩ            | 3.02 ±0.25 | 6.35 ±0.20 | 0.35 ±0.05 | 1.00 ±0.30 | 1.40 |
|             | 0.25mΩ           |            |            |            |            | 1.06 |
|             | 0.3mΩ            |            |            |            |            | 1.40 |
|             | 0.5mΩ            |            |            |            |            | 0.85 |
|             | 1mΩ              |            |            |            |            | 0.44 |
|             | 2mΩ              |            |            |            |            | 0.67 |
|             | 3mΩ              |            |            |            |            | 0.42 |
|             | 4mΩ              |            |            |            |            | 0.33 |
| SSA3921     | 0.2mΩ            | 5.20 ±0.30 | 10.0 ±0.30 | 0.50 ±0.10 | 2.00 ±0.30 | 1.40 |
|             | 0.3mΩ            |            |            |            |            | 1.28 |
|             | 0.5mΩ            |            |            |            |            | 0.83 |
|             | 0.75mΩ           |            |            |            |            | 0.56 |
|             | 1mΩ              |            |            |            |            | 0.42 |
|             | 2mΩ              |            |            |            |            | 0.58 |
|             | 3mΩ              |            |            |            |            | 0.38 |
|             | 4mΩ              |            |            |            |            | 0.28 |
| SSA5931     | 0.2mΩ            | 7.75 ±0.30 | 15.0 ±0.30 | 0.50 ±0.10 | 4.00 ±0.30 | 1.35 |
|             | 0.3mΩ            |            |            |            |            | 1.13 |
|             | 0.5mΩ            |            |            |            |            | 0.62 |
|             | 0.7mΩ            |            |            |            |            | 0.43 |
|             | 0.75mΩ           |            |            |            |            | 0.38 |
|             | 1mΩ              |            |            |            |            | 1.07 |
|             | 2mΩ              |            |            |            |            | 0.49 |
|             | 3mΩ              |            |            |            |            | 0.34 |

# Two-Terminal, Metal Type Current Shunt Resistor

## SSA Series

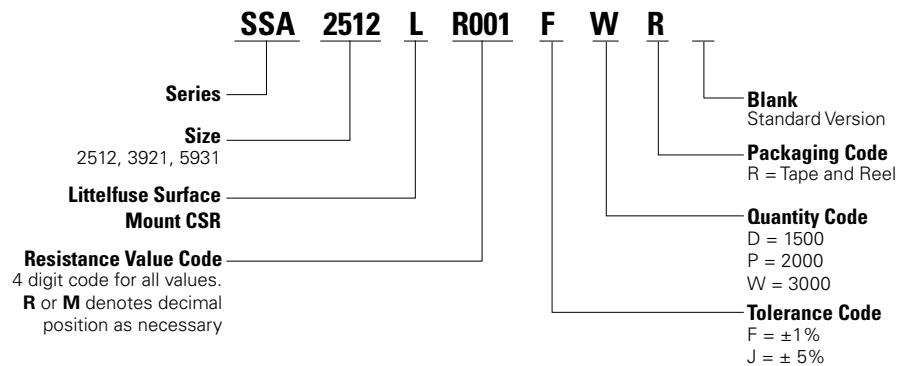
### Recommended Land Pattern



| Part Number | Resistance  | P       | D       | W       |
|-------------|-------------|---------|---------|---------|
| SSA2512     | 0.2 mΩ~4 mΩ | 3.60 mm | 1.60 mm | 3.40 mm |
| SSA3921     | 0.2 mΩ~4 mΩ | 5.60 mm | 2.70 mm | 6.20 mm |
| SSA5931     | 0.2 mΩ~3 mΩ | 5.60 mm | 5.20 mm | 8.75 mm |

**Note:** Provisions must be made to ensure that the part does not exceed the maximum operating temperature in the customers application.

### Part Numbering System



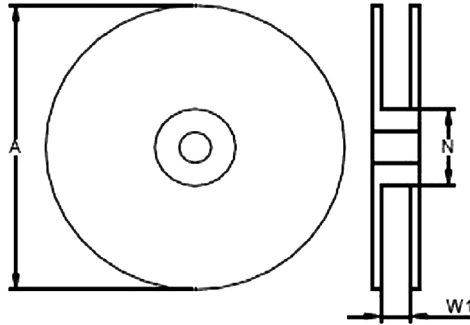
### Packaging

| Part Number | Resistance Value (Ω) | Halogen Free | Packaging Option | Quantity | Quantity & Packaging Codes |
|-------------|----------------------|--------------|------------------|----------|----------------------------|
| SSA2512     | 0.2 mΩ~0.3 mΩ        | Yes          | Tape and Reel    | 2000     | PR                         |
|             | 0.5 mΩ~4 mΩ          | Yes          | Tape and Reel    | 3000     | WR                         |
| SSA3921     | 0.2 mΩ~4 mΩ          | Yes          | Tape and Reel    | 3000     | WR                         |
| SSA5931     | 0.2 mΩ~3 mΩ          | Yes          | Tape and Reel    | 1500     | DR                         |

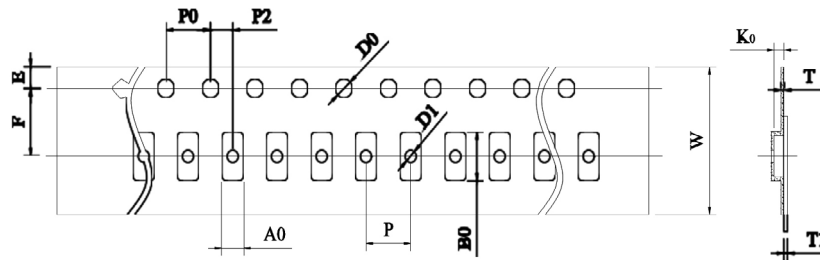
# Two-Terminal, Metal Type Current Shunt Resistor

## SSA Series

### Tape and Reel Specifications



| Size | Resistance Value ( $\Omega$ )  | A $\pm$ 5 (mm) | N $\pm$ 2 (mm) | W1 $\pm$ 1 (mm) |
|------|--------------------------------|----------------|----------------|-----------------|
| 2512 | 0.3 m $\Omega$ ~4.0 m $\Omega$ | 178            | 60             | 13.0            |
| 3921 | 0.2 m $\Omega$ ~4.0 m $\Omega$ | 330            | 100            | 24.5            |
| 5931 | 0.2 m $\Omega$ ~3.0 m $\Omega$ | 330            | 100            | 24.5            |



| Size | Resistance ( $\Omega$ )                                  | W (mm)           | P0 (mm)         | P (mm)           | P2 (mm)         | A0 (mm)         | B0 (mm)          | D0 (mm)         | F (mm)           | E (mm)          | T (mm)          | T1 (mm)  | K0 (mm)         |
|------|----------------------------------------------------------|------------------|-----------------|------------------|-----------------|-----------------|------------------|-----------------|------------------|-----------------|-----------------|----------|-----------------|
| 2512 | 0.2m $\Omega$ ~0.3m $\Omega$                             | 12.00 $\pm$ 0.30 | 4.00 $\pm$ 0.10 | 4.00 $\pm$ 0.10  | 2.00 $\pm$ 0.10 | 3.40 $\pm$ 0.20 | 6.75 $\pm$ 0.20  | 1.55 $\pm$ 0.10 | 5.50 $\pm$ 0.10  | 1.75 $\pm$ 0.10 | 0.20 $\pm$ 0.10 | Max 0.10 | 1.85 $\pm$ 0.20 |
|      | 0.5m $\Omega$ , 2m $\Omega$                              | 12.00 $\pm$ 0.30 | 4.00 $\pm$ 0.10 | 4.00 $\pm$ 0.10  | 2.00 $\pm$ 0.10 | 3.40 $\pm$ 0.20 | 6.75 $\pm$ 0.20  | 1.55 $\pm$ 0.10 | 5.50 $\pm$ 0.10  | 1.75 $\pm$ 0.10 | 0.40 $\pm$ 0.10 | Max 0.10 | 1.30 $\pm$ 0.20 |
|      | 1m $\Omega$ , 3m $\Omega$ , 4m $\Omega$                  | 12.00 $\pm$ 0.30 | 4.00 $\pm$ 0.10 | 4.00 $\pm$ 0.10  | 2.00 $\pm$ 0.10 | 3.40 $\pm$ 0.20 | 6.75 $\pm$ 0.20  | 1.55 $\pm$ 0.10 | 5.50 $\pm$ 0.10  | 1.75 $\pm$ 0.10 | 0.20 $\pm$ 0.10 | Max 0.10 | 0.98 $\pm$ 0.20 |
| 3921 | 0.2m $\Omega$ ~0.3m $\Omega$                             | 24.00 $\pm$ 0.30 | 4.00 $\pm$ 0.10 | 8.00 $\pm$ 0.10  | 2.00 $\pm$ 0.10 | 5.70 $\pm$ 0.20 | 11.50 $\pm$ 0.20 | 1.55 $\pm$ 0.10 | 11.50 $\pm$ 0.10 | 1.75 $\pm$ 0.10 | 0.30 $\pm$ 0.10 | Max 0.10 | 2.10 $\pm$ 0.10 |
|      | 0.5m $\Omega$ ~4m $\Omega$                               | 24.00 $\pm$ 0.30 | 4.00 $\pm$ 0.10 | 8.00 $\pm$ 0.10  | 2.00 $\pm$ 0.10 | 5.70 $\pm$ 0.20 | 11.50 $\pm$ 0.20 | 1.55 $\pm$ 0.10 | 11.50 $\pm$ 0.10 | 1.75 $\pm$ 0.10 | 0.30 $\pm$ 0.10 | Max 0.10 | 1.50 $\pm$ 0.10 |
| 5931 | 0.2m $\Omega$ ~0.3m $\Omega$ , 1m $\Omega$               | 24.00 $\pm$ 0.30 | 4.00 $\pm$ 0.10 | 12.00 $\pm$ 0.10 | 2.00 $\pm$ 0.10 | 8.25 $\pm$ 0.20 | 15.50 $\pm$ 0.20 | 1.55 $\pm$ 0.10 | 11.50 $\pm$ 0.10 | 1.75 $\pm$ 0.10 | 0.30 $\pm$ 0.10 | Max 0.10 | 2.10 $\pm$ 0.10 |
|      | 0.5m $\Omega$ ~0.75m $\Omega$ , 2m $\Omega$ ~3m $\Omega$ | 24.00 $\pm$ 0.30 | 4.00 $\pm$ 0.10 | 12.00 $\pm$ 0.10 | 2.00 $\pm$ 0.10 | 8.25 $\pm$ 0.20 | 15.50 $\pm$ 0.20 | 1.55 $\pm$ 0.10 | 11.50 $\pm$ 0.10 | 1.75 $\pm$ 0.10 | 0.30 $\pm$ 0.10 | Max 0.10 | 1.50 $\pm$ 0.10 |

**Note:** Tape and reel packaging in accordance to EIA-481

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