



Product division: NTC

Product type: S234/xxx/M

Product name: Inrush Current Limiter

Ordering code: B57234S0xxxM000

Data sheet

## APPLICATION :

NTC-thermistor for inrush current limiting in peripheral communication equipment, e.g. in switch-mode power supplies

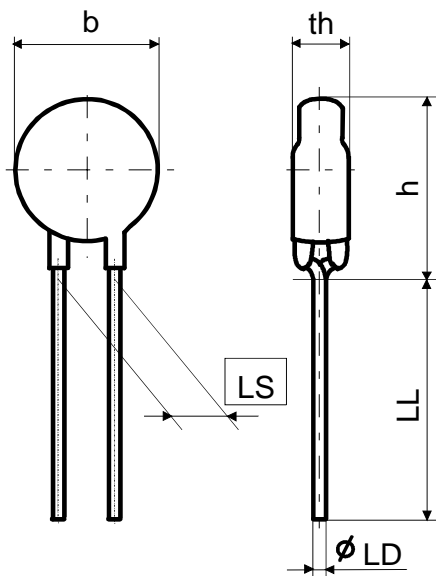
## FEATURES :

- Black coated thermistor disk
- Coating material is flame retardant (UL 94 V-0 approved)
- Kinked leads of tinned copper wire
- Lead spacing 7.5 mm
- Manufacturer's logo, NTC and resistance value stamped in white
- High stability of electrical characteristic
- Terminals solderable in accordance with IEC 60068-2-20, test ta, method 1
- ICL support to fulfill the requirements according EN 61000 of power circuits
- Usable in series connections up to 265 V<sub>rms</sub>
- UL approval (E 69802)
- The component is compliant with ROHS (DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment
- Also available on tape

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**Data sheet**
**DRAWING :**


|    |                      |    |
|----|----------------------|----|
| b  | 15.0max              | mm |
| th | 7.0 max              | mm |
| h  | 22.0 max             | mm |
| LL | 32 <sup>+3</sup>     | mm |
| LD | 0.8 <sup>±0.05</sup> | mm |
| LS | 7.5 <sup>±0.8</sup>  | mm |

Approx. weight : 2.0 [g]

**RATINGS AND CHARACTERISTICS**

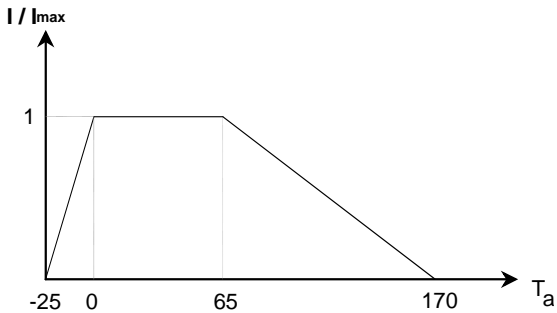
|  |                  |        |                     |
|--|------------------|--------|---------------------|
| Lower/upper category temperature       | T                | [°C]   | <b>-55/+170</b>     |
| Resistance tolerance                   | $\Delta R/R_N$   | [%]    | <b>± 20</b>         |
| Rated temperature                      | T <sub>N</sub>   | [°C]   | <b>25</b>           |
| B value tolerance                      | $\Delta B/B$     | [%]    | <b>± 3</b>          |
| Max. power at 25°C                     | P <sub>max</sub> | [W]    | <b>3.6</b>          |
| Dissipation factor (in air)            | $\delta_{th}$    | [mW/K] | <b>approx. 17</b>   |
| Thermal cooling time constant (in air) | $\tau_{th}$      | [s]    | <b>approx. 90</b>   |
| Heat capacity                          | C <sub>th</sub>  | [mJ/K] | <b>approx. 1530</b> |

| Ordering Code   | R <sub>25</sub><br>[Ω] | I <sub>max</sub><br>[A] | B <sub>25/100</sub><br>[K] | C <sub>T</sub> at 110<br>VAC<br>[μF] | C <sub>T</sub> at 230<br>VAC<br>[μF] | Parameter<br>for R(l)<br>k | Parameter<br>for R(l)<br>n |
|-----------------|------------------------|-------------------------|----------------------------|--------------------------------------|--------------------------------------|----------------------------|----------------------------|
| B57234S0109M000 | 1.0                    | 11.5                    | 2600                       | 2800                                 | 700                                  | 0.622                      | -1.27                      |
| B57234S0229M000 | 2.2                    | 9.0                     | 2800                       | 2800                                 | 700                                  | 0.806                      | -1.30                      |
| B57234S0259M000 | 2.5                    | 8.4                     | 2800                       | 2000                                 | 500                                  | 0.843                      | -1.30                      |
| B57234S0479M000 | 4.7                    | 6.6                     | 2900                       | 2800                                 | 700                                  | 1.03                       | -1.32                      |
| B57234S0509M000 | 5.0                    | 6.4                     | 2900                       | 2800                                 | 700                                  | 1.05                       | -1.32                      |
| B57234S0709M000 | 7.0                    | 6.0                     | 3000                       | 2800                                 | 700                                  | 1.16                       | -1.33                      |
| B57234S0100M000 | 10                     | 5.0                     | 3060                       | 2800                                 | 700                                  | 1.29                       | -1.34                      |
| B57234S0150M000 | 15                     | 4.0                     | 3000                       | 2800                                 | 700                                  | 1.49                       | -1.33                      |
| B57234S0220M000 | 22                     | 4.0                     | 3300                       | 2800                                 | 700                                  | 1.57                       | -1.37                      |
| B57234S0330M000 | 33                     | 3.3                     | 3300                       | 3600                                 | 900                                  | 1.78                       | -1.37                      |

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**Data sheet**
**Maximum continuous current  $I_{max}$  :**

The  $I_{max}$  denotes the maximum permissible continuous current (dc or rms values for sine-shaped ac) in the temperature range 0 to 65°C.

**Maximum current derating ( $I / I_{max}$ ) :**


$$\text{Percent of } I_{max} = 100 \left[ 1 - \frac{T_A - 65^\circ C}{T_{max} - 65^\circ C} \right]$$

$T_A$  = ambient temperature ( $T_A > 65^\circ C$ )  
 $T_{max} = 170^\circ C$

Fig. 1. - Maximum current derating ( $I / I_{max}$ )

**Maximum switchable capacity ( $C_T$ ) :**

The maximum switchable capacity ( $C_T$ ) is the maximum capacity which may be discharged across the thermistor. See Fig.2 Maximum switchable capacity measuring circuit.

**Dependence of NTC resistance on current :**

The resistance effective in the usual current range can be approximated with the fit parameter **k** and **n**.

$$R_{NTC} = k * I^n \quad 0.3 * I_{max} < I \leq I_{max}$$

$R_{NTC}$  Resistance value to be determined at current  $I$  [ $\Omega$ ]

$k, n$  Fit parameter, see table with ordering codes

$I$  Current flowing through the NTC (insert numerical value in A)

The calculated values only serve as an estimate for operation in still air at an ambient temperature of 25°C.

**MARKING :**

- EPCOS – logo
- resistance value
- NTC
- Date code with 4 digits (year and week of production): 0540 (example for week 40 in year 2005)

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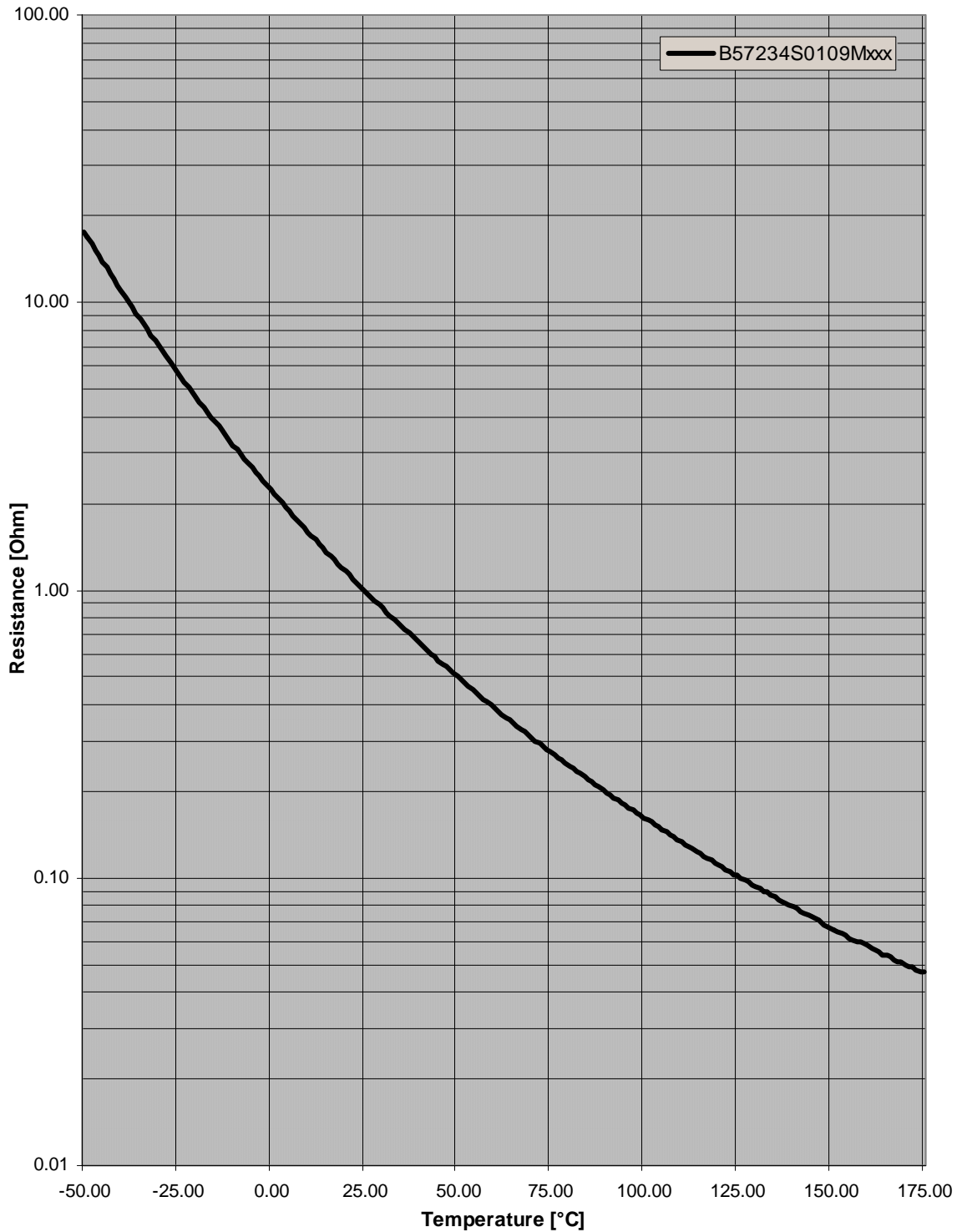
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Product name: Inrush Current Limiter

Ordering code: B57234S0xxxM000

Data sheet

### Resistance - Temperature Curve



|            |          |       |   |           |         |      |      |
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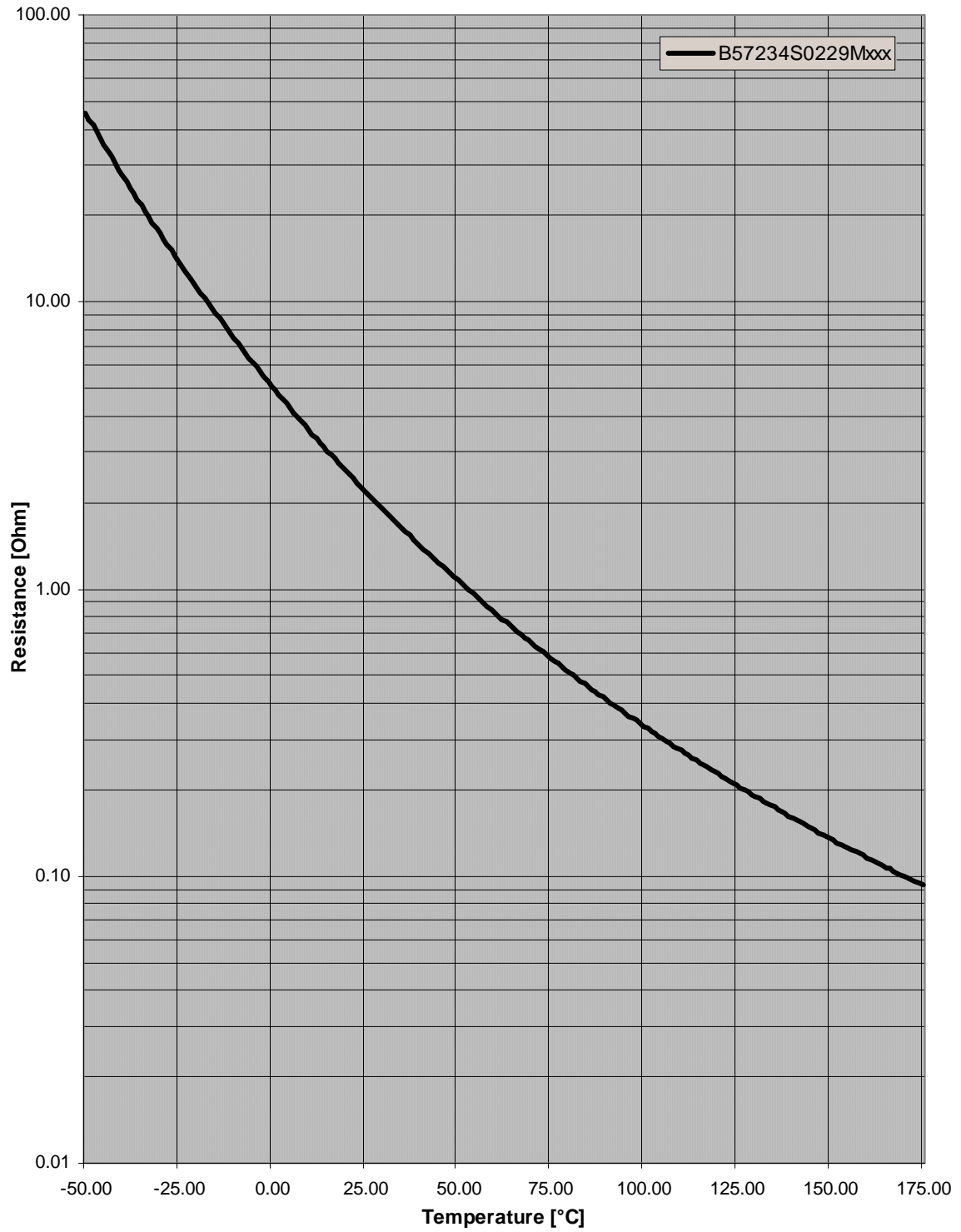
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Data sheet

### Resistance - Temperature Curve



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Product division: NTC

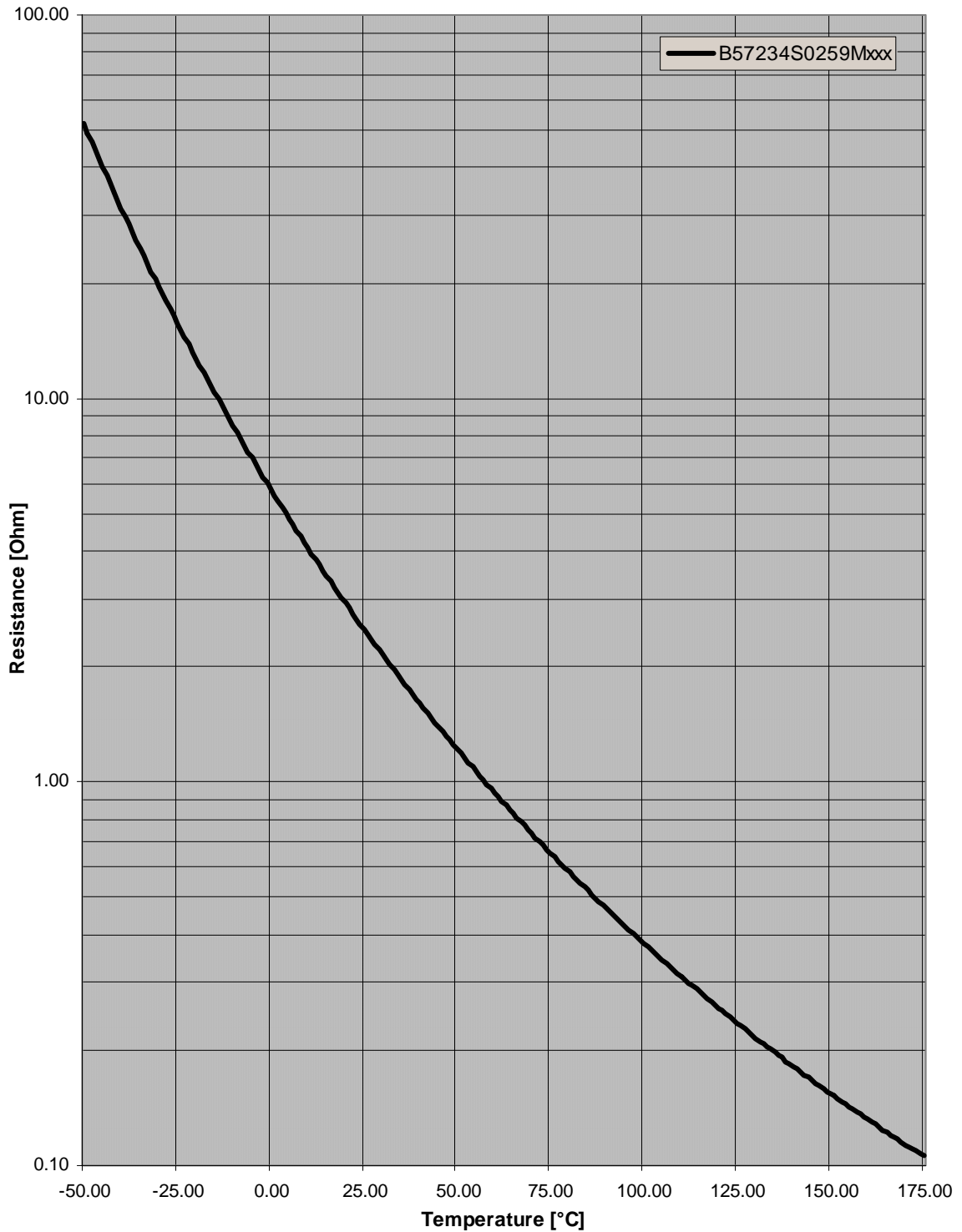
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Data sheet

Resistance - Temperature Curve



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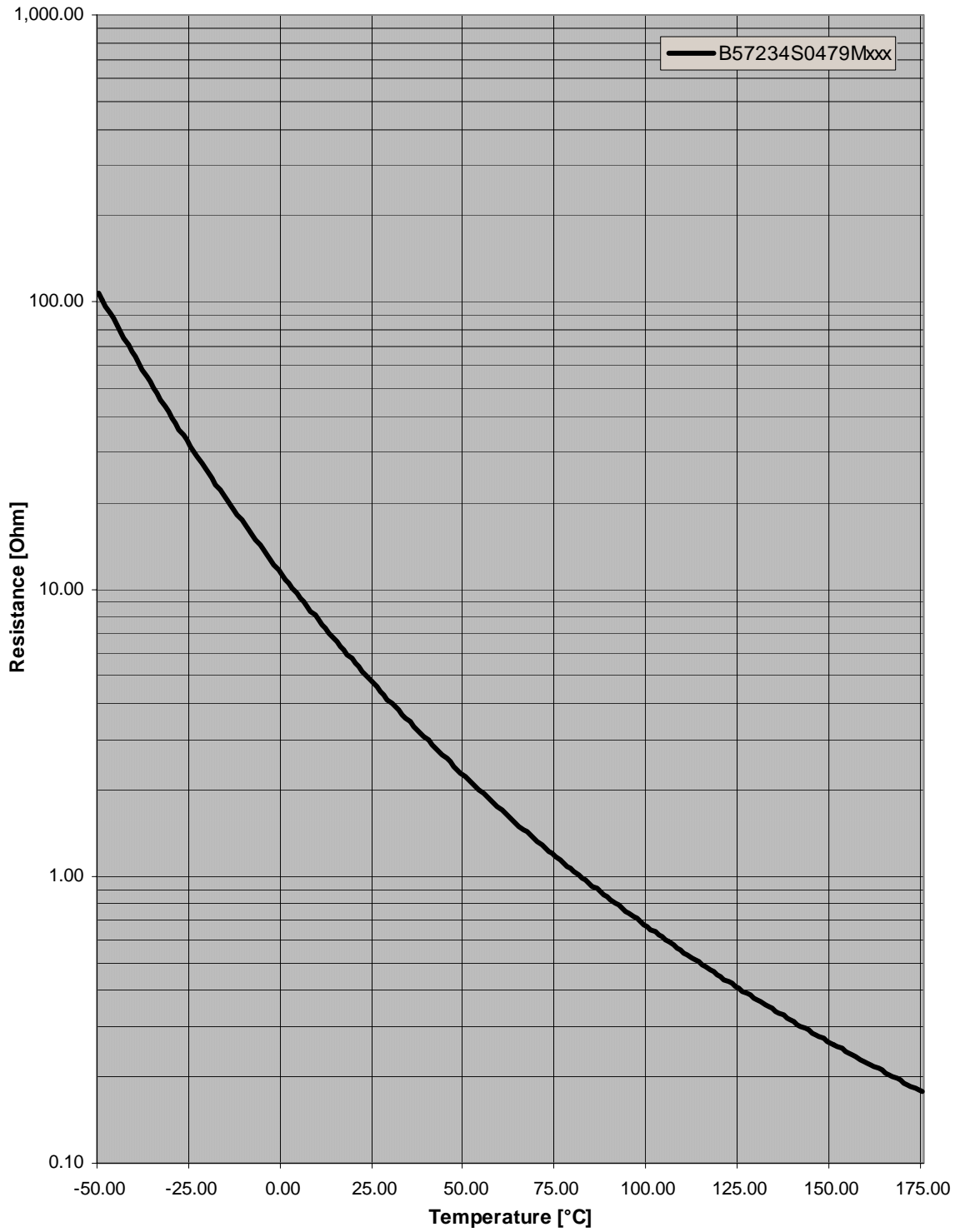
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### Resistance - Temperature Curve



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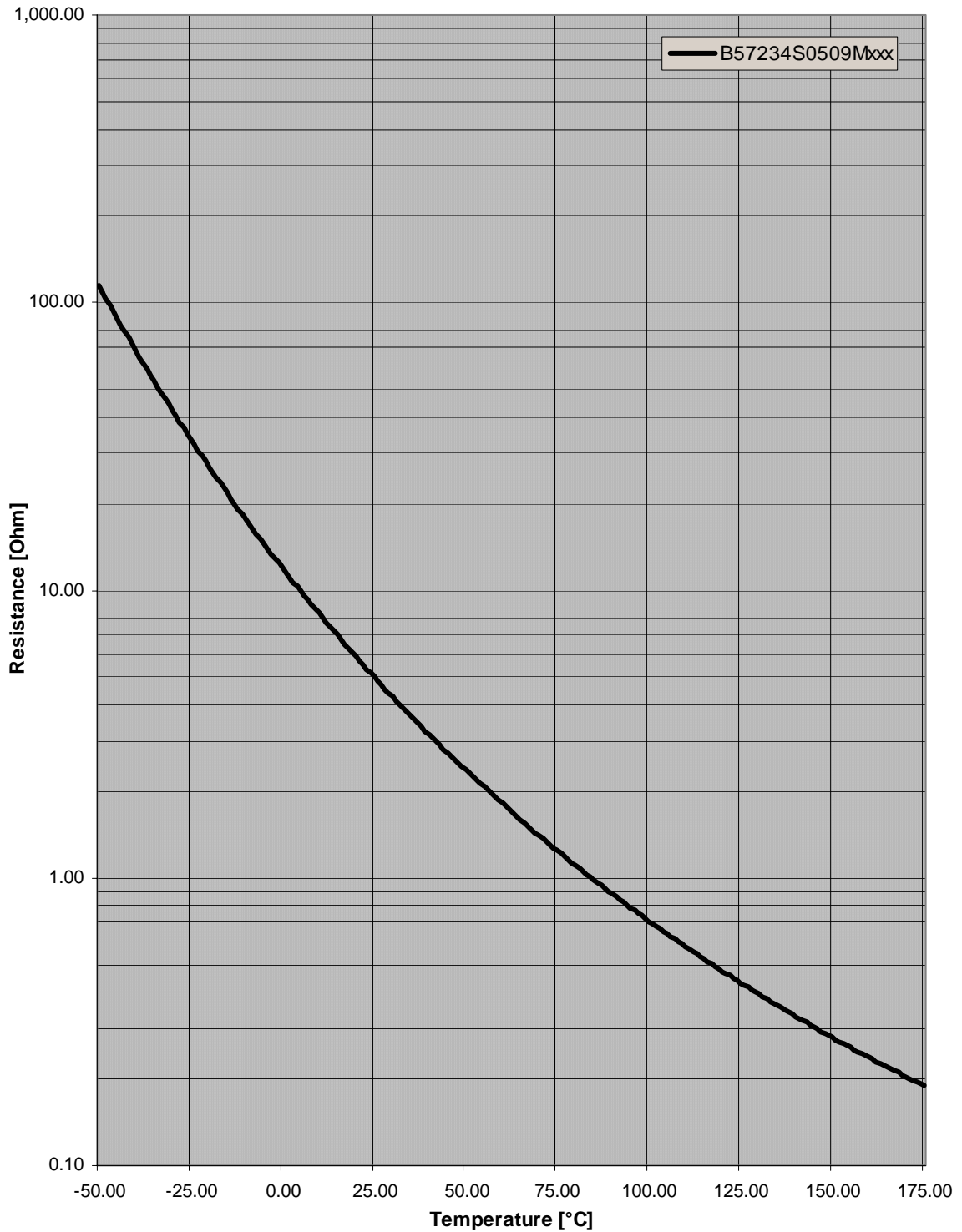
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Data sheet

### Resistance - Temperature Curve



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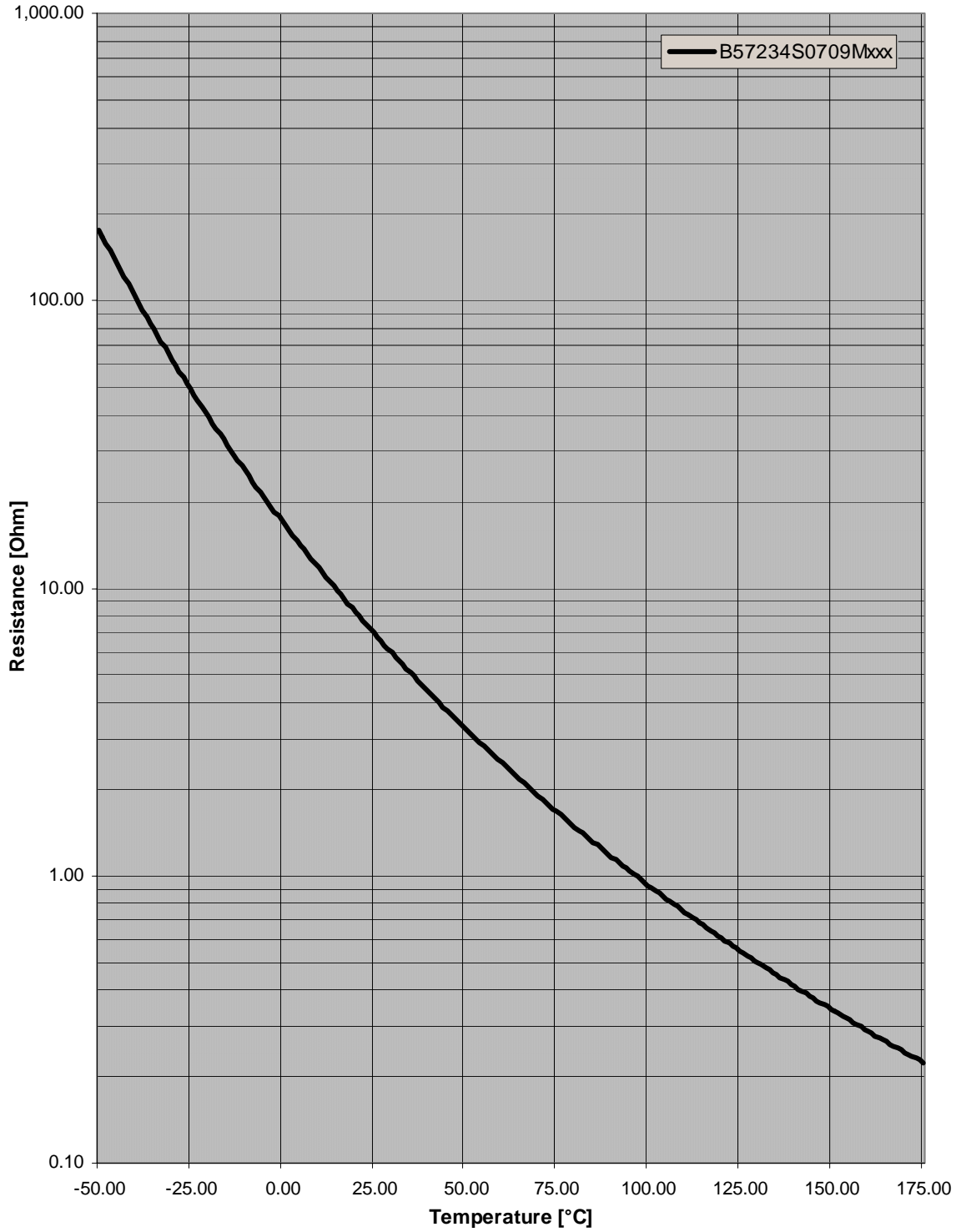
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Resistance - Temperature Curve



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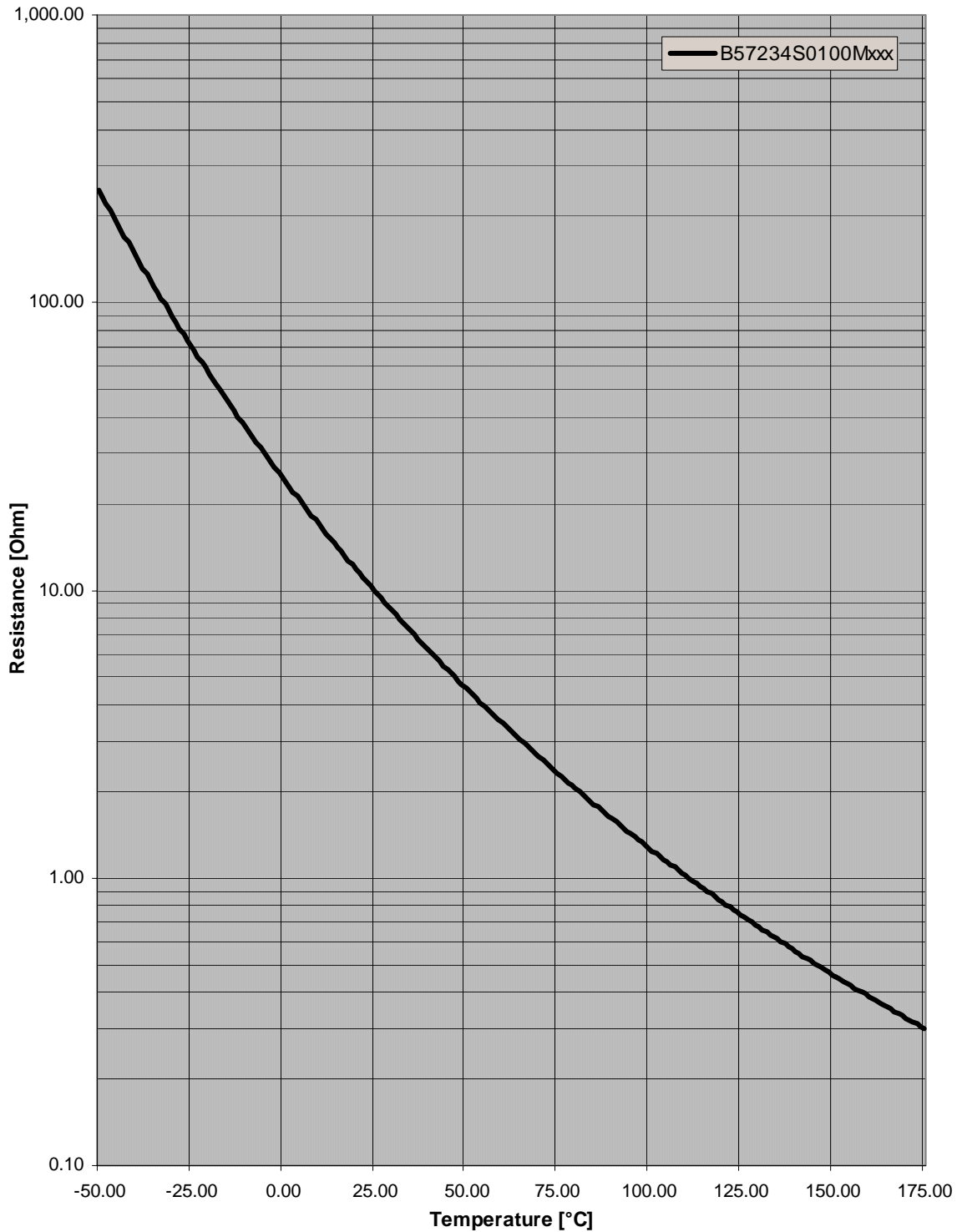
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Resistance - Temperature Curve



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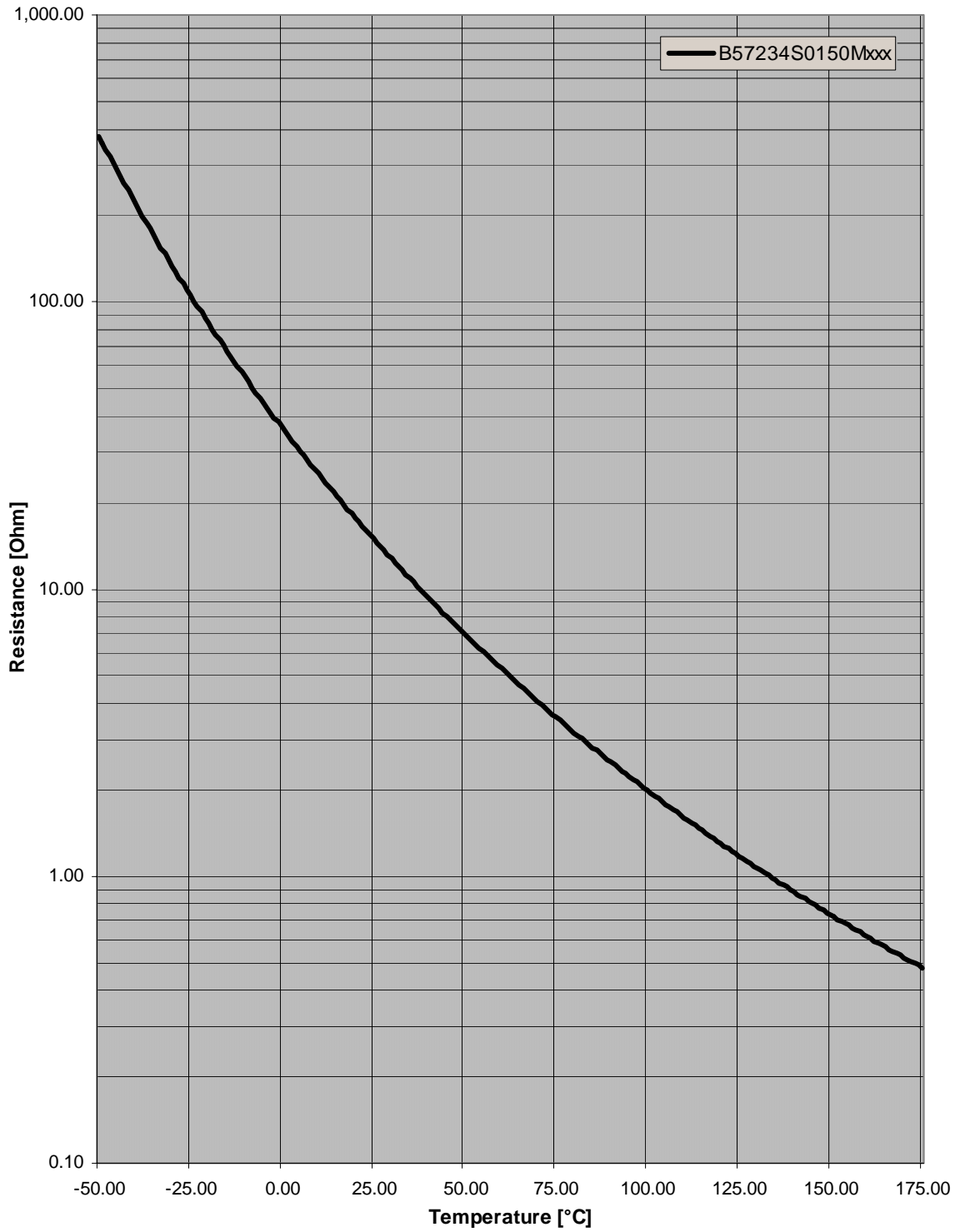
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### Resistance - Temperature Curve



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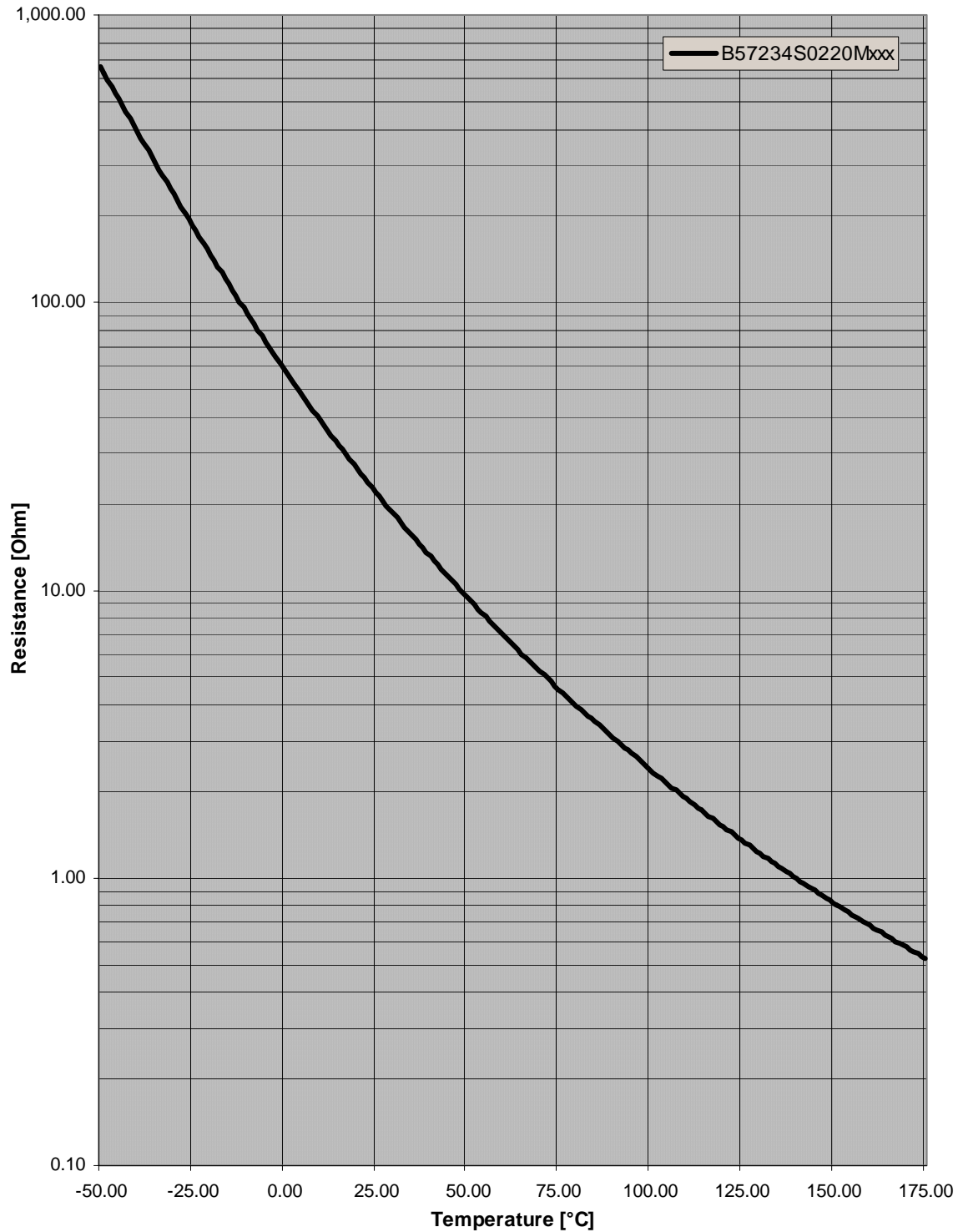
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Resistance - Temperature Curve



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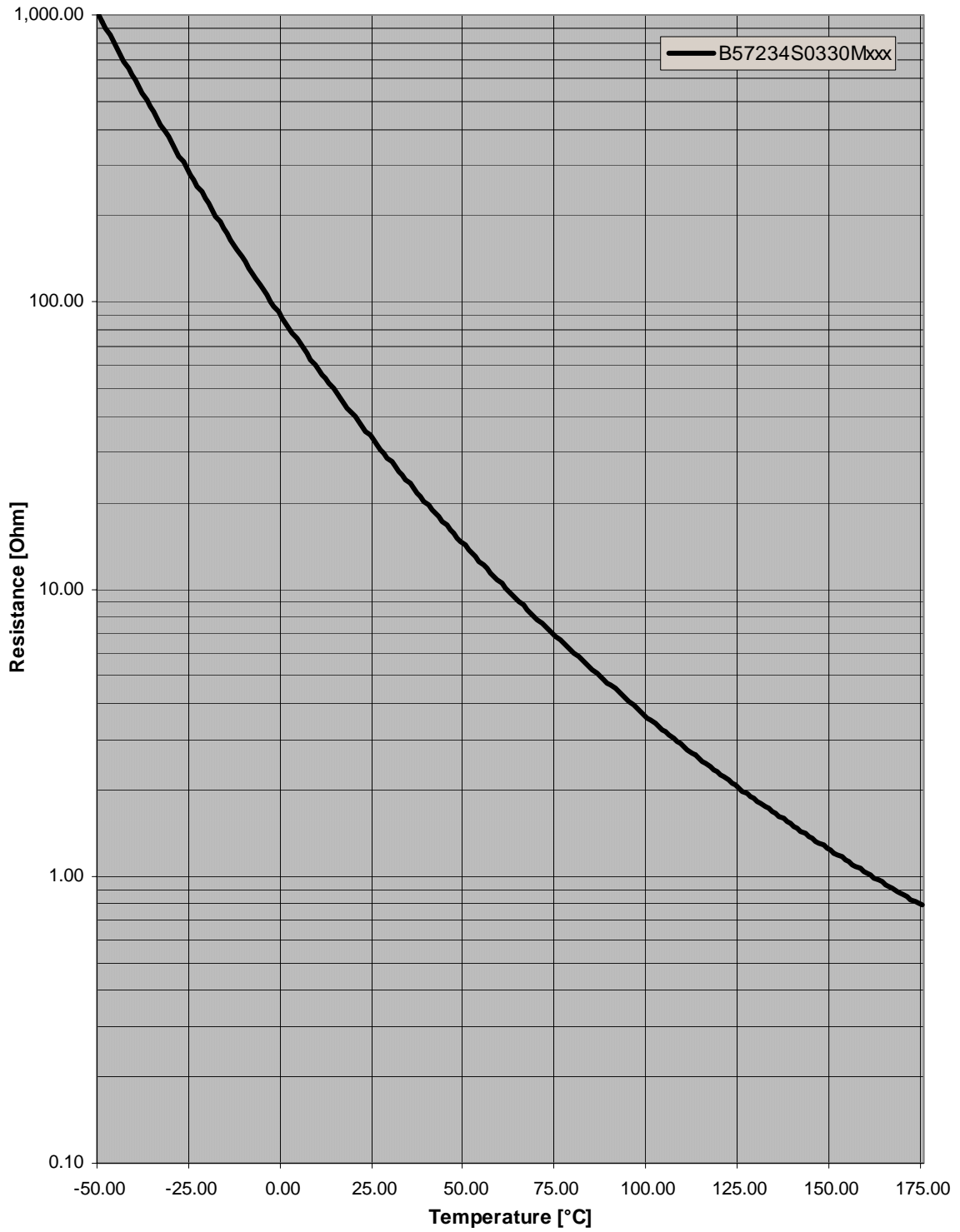
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Resistance - Temperature Curve



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## ROBUSTNESS OF TERMINATIONS :

The leads meet the requirements of IEC 60068-2-21.

| Test             | Test conditions   | Remarks  |
|------------------|---|--|
| Tensile strength | Test Ua1: Fasten body with a force applied to each lead 10 [N] for 10 [s]             | No visible damage  |
| Bending strength | Test Ub:<br>Fasten body with two 90°-bends in opposite direction at a force of 10 [N] | No visible damage<br>(Peel off of coating along the lead accepted) |

## RELIABILITY REQUIREMENTS :

| Test                                | Standard          | Test conditions   | $\Delta R_{25}/R_{25}$<br>(typical) | Remarks           |
|-------------------------------------|-------------------|---|-------------------------------------|-------------------|
| Storage in dry heat                 | IEC<br>60068-2-2  | Storage at upper category temperature<br>T: 170°C<br>t: 1 000 h   | < 10 %                              | No visible damage |
| Storage in damp heat, steady state  | IEC<br>60068-2-3  | Temperature of air: 40°C<br>Relative humidity of air: 93 %<br>Duration: 21 days   | < 5 %                               | No visible damage |
| Rapid change of temperature         | IEC<br>60068-2-14 | Lower test temperature:<br>-55°C (time: 15 min)<br>Upper test temperature:<br>170°C (time: 15 min)<br>Time to change from lower to upper temperature : < 30 sec<br>Number of cycles: 10 | < 10 %                              | No visible damage |
| Endurance (storage at max. current) |                   | $I = I_{max}$<br>t = 1000 h<br>T = 25°C   | < 10 %                              | No visible damage |
| Electrical cycling test             | *                 | $I = I_{max}$<br>load on: 1 min<br>load off: 6 min<br>Number of cycles: 1000  | < 10 %                              | No visible damage |
| Maximum switchable capacity test    | **                | Capacity = $C_T$<br>Number of cycles: 1000  | < 5 %                               | No visible damage |

|            |          |       |   |           |         |      |       |
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## Soldering of Components

| Process   | Conditions   | Remarks              |
|-----------|--|----------------------|
| Soldering | <b>Dip soldering</b> : 260°C max, 4 sec max,<br>6mm min from thermistor body<br><b>Iron soldering</b> : 360°C max, 2 sec max,<br>6 mm min from thermistor body | Low resistance drift |

### \* Electrical cycling Test

Each cycle has to start with parts cooled down to room temperature. It has to cover the portion of the R/T curve between room temperature and the resistance of the components as stabilized at the maximum continuous current  $I_{max}$  (that is the minimum operating resistance). One cycle lasts 7 minutes.

### \*\* Maximum switchable capacity test

The capacitor ( $C_T$ ) is discharged across a series fixed resistor and the thermistor, shown in Figure 2. The charge voltage is chosen so that the voltage applied to the thermistor at the beginning of discharge is 170/345 [V], corresponding to  $(110/230V + \Delta V) * 1.41$ .

The capacitor is discharged across a series fixed resistor and the thermistor 1 000 times at ambient temperature of between 15°C and 35°C. Each cycle has to start with thermistors cooled down to ambient temperature.

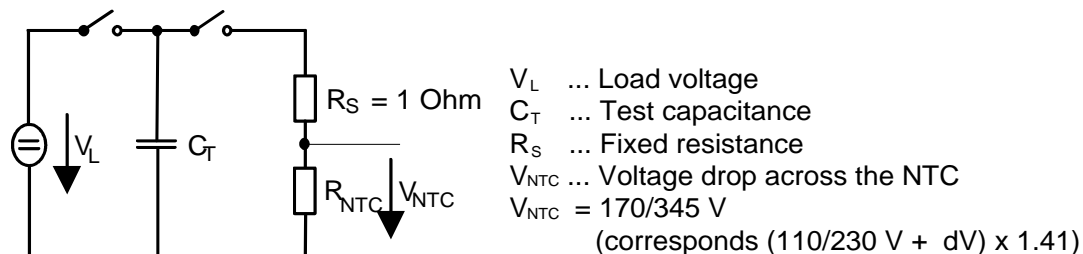


Fig. 2. - Maximum switchable capacity measuring circuit

## TAPING AND PACKING :

### Packing codes :

The last two digits of the complete ordering code state the packing mode :

| Packing      |      | Code | Number of Pieces |
|--------------|------|------|------------------|
| Bulk packing | Bulk | 00   | 500              |
| Reel packing | Tape | 51   | 1000             |
| AMMO packing | Tape | 54   | 750              |

**Data sheet**

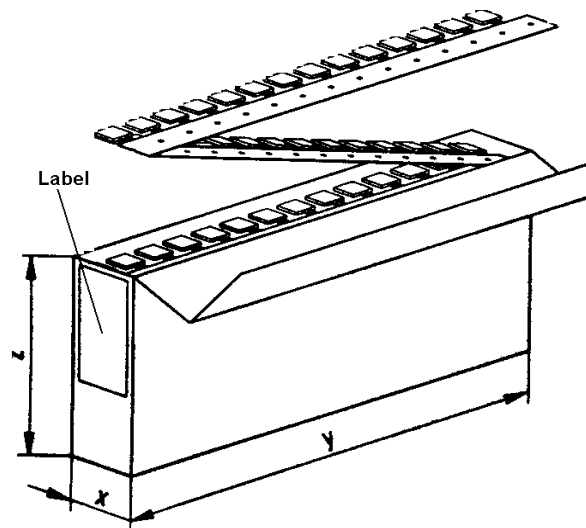
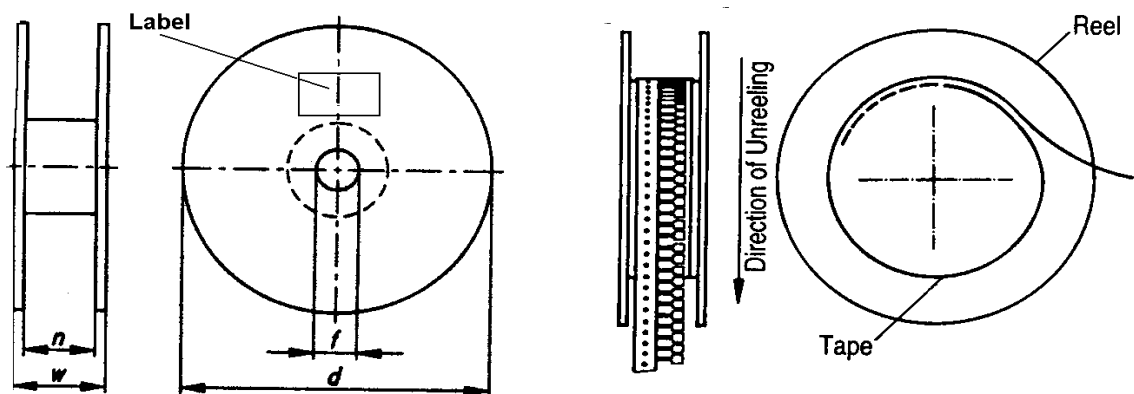
Example :    B57234S0100M000    untaped  
                  B57234S0100M051    taped reel packing

**Table 1: Package dimensions and weights of unit packages**

| Packing | Pcs / unit | Approx. Weight (g) | Dimensions (mm)                       |
|---------|------------|--------------------|---------------------------------------|
| Bulk    | 500        | 1100               | x=65, y=230, z=125                    |
| Ammo    | 750        | 2100               | x=56, y=355, z=355                    |
| Reel    | 1000       | 2500               | d=500, f=23±1, n=approx. 59, w=72 max |

Dimensions x, y, z acc. to fig. 1

Dimensions d, f, n, w acc. to fig. 2

**Drawings**

**Fig. 1: AMMO packing**

**Fig. 2: Reel packing**

|            |          |       |   |           |         |      |       |
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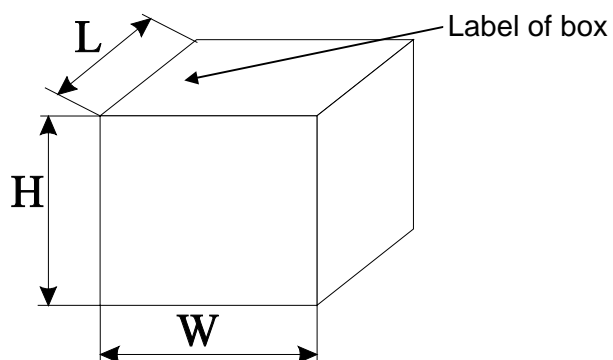
**Data sheet**
**Shipping package**
**Table 2: Dimensions and weights of shipping package.**

| BULK                            |                  |                           |
|---------------------------------|------------------|---------------------------|
| Dimensions<br>L x W x H<br>(mm) | Pcs/package<br>- | Approx.<br>Weight<br>(kg) |
| 330x230x100                     | 1000             | 3.1                       |
| 260x180x190                     | 1500             | 4.3                       |
| 360x360x130                     | 4000             | 11.5                      |
| 370x270x270                     | 6000             | 16.8                      |
| 354x354x274                     | 7500             | 21.2                      |

| AMMO                            |                  |                           |
|---------------------------------|------------------|---------------------------|
| Dimensions<br>L x W x H<br>(mm) | Pcs/package<br>- | Approx.<br>Weight<br>(kg) |
| 354x354x58                      | 750              | 2.6                       |
| 354x354x112                     | 1500             | 4.8                       |
| 354x354x166                     | 2250             | 7.0                       |
| 354x354x220                     | 3000             | 9.2                       |
| 354x354x274                     | 3750             | 11.4                      |

| REEL                            |                  |                           |
|---------------------------------|------------------|---------------------------|
| Dimensions<br>L x W x H<br>(mm) | Pcs/package<br>- | Approx.<br>Weight<br>(kg) |
| 505x505x74                      | 1000             | 3.5                       |
| 505x505x220                     | 3000             | 9.8                       |
| 505x505x360                     | 5000             | 15.7                      |

L x W x H acc. to fig. 3.

**Drawing**

**Fig. 3: Shipping Package**

**Packing material:** Cardboard box

|            |          |       |   |           |         |      |       |
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