



Product division: NTC

Product type: S234/60/M\*

Product name: Inrush Current Limiter

Ordering code: B57234S0600Mxxx

Data sheet

## APPLICATION :

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

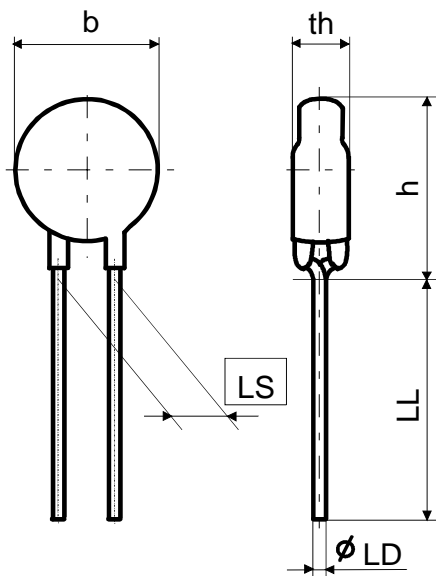
## FEATURES :

- 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>
- 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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**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]

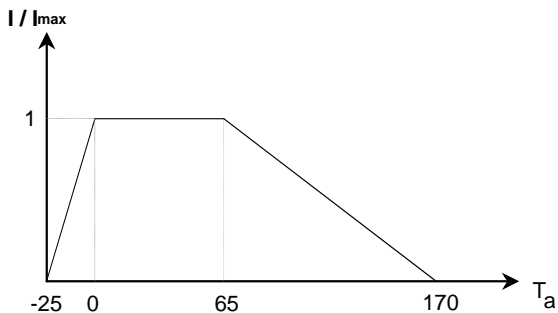
**RATINGS AND CHARACTERISTICS**

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> [Ω]	I <sub>max</sub> [A]	B <sub>25/100</sub> [K]	C <sub>T</sub> at 110 VAC [μF]	C <sub>T</sub> at 230 VAC [μF]	Parameter for R(I) k	Parameter for R(I) n
B57234S0600Mxxx	60	4.0	4000	1600	400	1.77	-1.44

**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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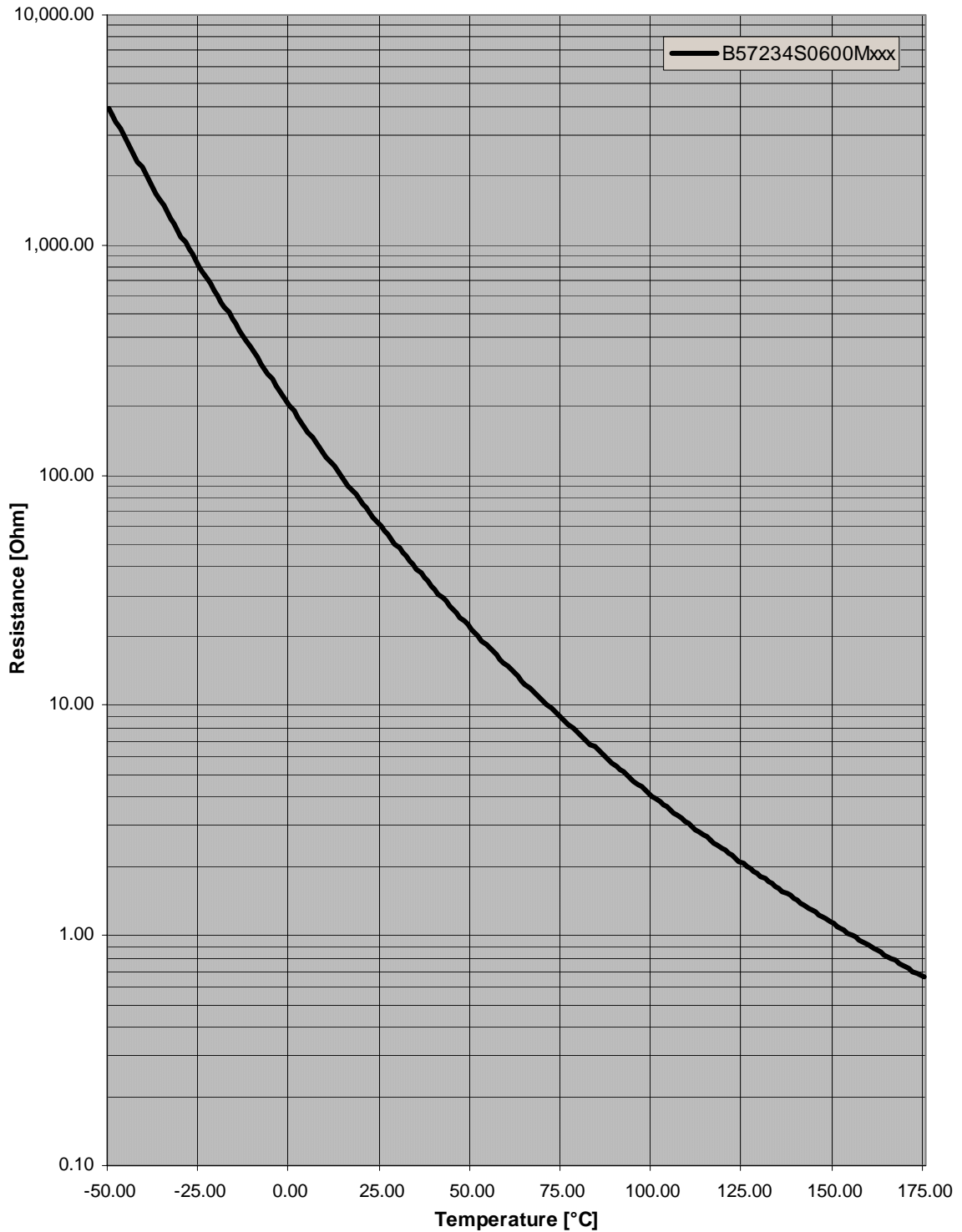
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### Resistance - Temperature Curve



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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: Fasten body with two 90°-bends in opposite direction at a force of 10 [N]	No visible damage (Peel off of coating along the lead accepted)

## RELIABILITY REQUIREMENTS :

Test	Standard	Test conditions	$\Delta R_{25}/R_{25}$ (typical)	Remarks
Storage in dry heat	IEC 60068-2-2	Storage at upper category temperature T: 170°C t: 1 000 h	< 10 %	No visible damage
Storage in damp heat, steady state	IEC 60068-2-3	Temperature of air: 40°C Relative humidity of air: 93 % Duration: 21 days	< 5 %	No visible damage
Rapid change of temperature	IEC 60068-2-14	Lower test temperature: -55°C (time: 15 min) Upper test temperature: 170°C (time: 15 min) Time to change from lower to upper temperature : < 30 sec Number of cycles: 10	< 10 %	No visible damage
Endurance (storage at max. current)		$I = I_{max}$ t = 1000 h T = 25°C	< 10 %	No visible damage
Electrical cycling test	*	$I = I_{max}$ load on: 1 min load off: 6 min Number of cycles: 1000	< 10 %	No visible damage
Maximum switchable capacity test	**	Capacity = $C_T$ 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, 6mm min from thermistor body <b>Iron soldering</b> : 360°C max, 2 sec max, 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.

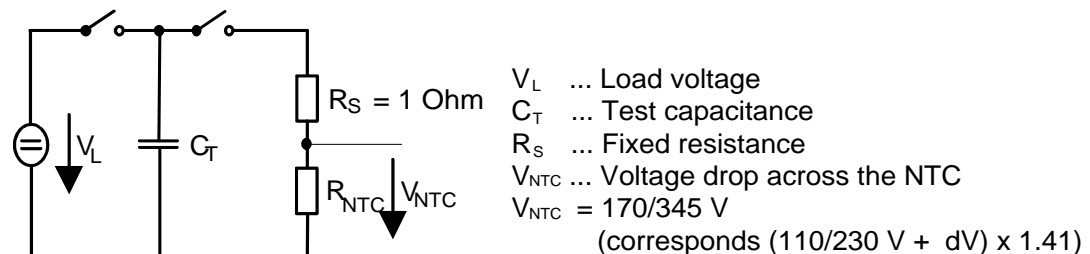


Fig. 2. - Maximum switchable capacity measuring circuit

## 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**

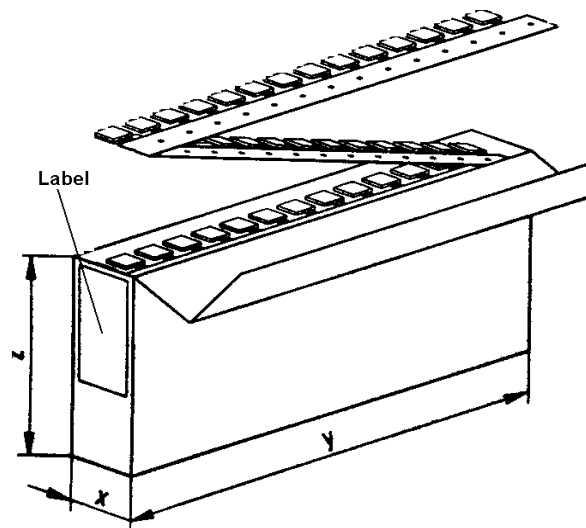
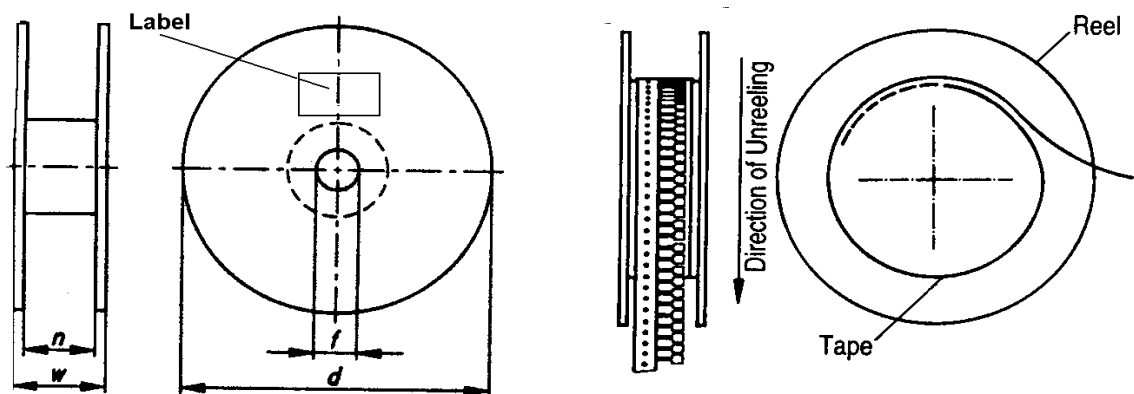
Example :    B57234S0600M000    untaped  
                  B57234S0600M051    taped reel packing

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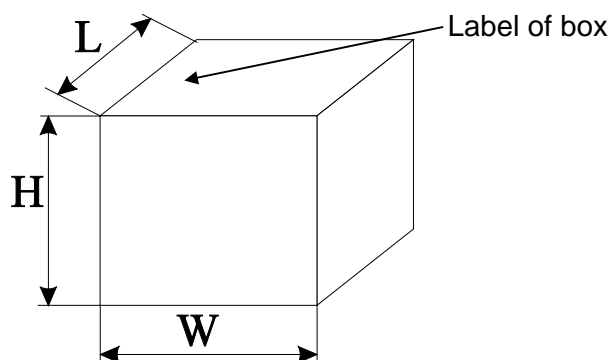
**Data sheet**
**Shipping package**
**Table 2: Dimensions and weights of shipping package.**

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

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

REEL		
Dimensions L x W x H (mm)	Pcs/package -	Approx. Weight (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**

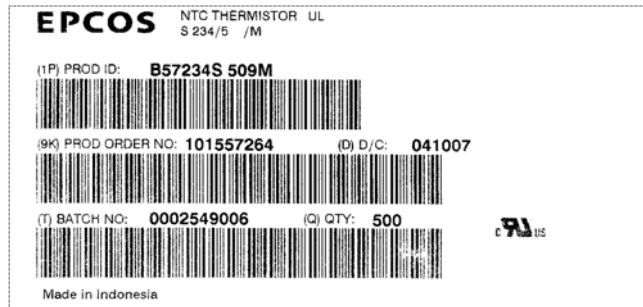
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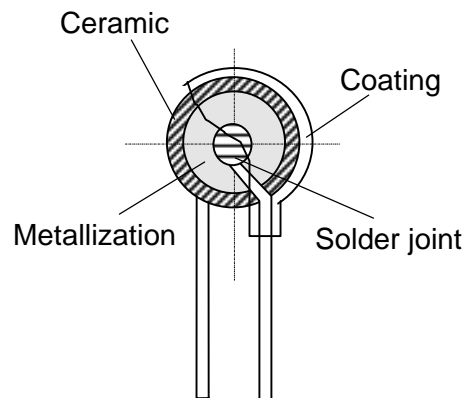
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**Label**

The shown label is an example for bulk packing. Type code and ordering code do not refer to the actual type.

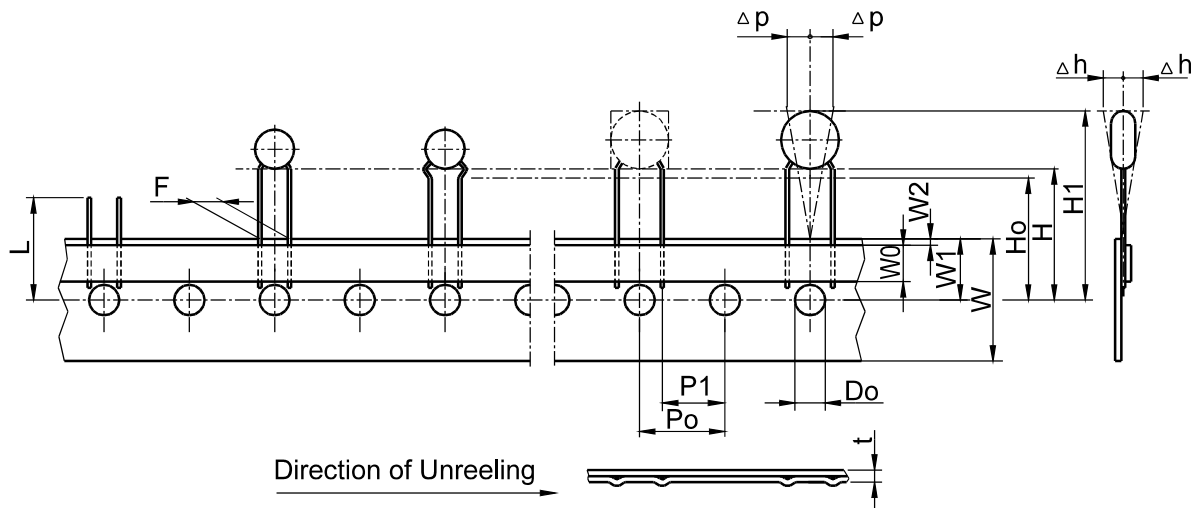


**Internal Construction**



The above picture shows the internal construction of EPCOS ICL's.

Note: Coating may have cracks or chips due to acting mechanical force on the wire, but this does not affect the performance of the component

**Data sheet**
**Taping specification :**


Dimensions and tolerances (taping in accordance with IEC 60286-2) :

Designation	Symbol	Nominal size [mm]	Tolerance [mm]	Remarks
Lead Spacing	F	7.5	± 0.8	
Pitch of holes	P0	12.7	± 0.3	± 1 mm/20 sprocket holes
Spacing hole center	P1	8.95	± 0.8	
Slope of component	Δ h	0	± 2.0	measured at top of component body
Slope of component	Δ p	0	± 2.0	
Spacing hole center / bottom edge of component	H	18.0	+2.0/-0	
Spacing hole center / niveau NTC	H0	16.0	± 0.5	
Spacing hole center / upper edge of component	H1	45.0	max.	
carrier type width	W	18.0	± 0.5	
hot adhesive tape width	W0	5.5	min.	peel-off force ≥ 5 N
position of holes	W1	9.0	+0.75/-0.5	
position of adhesive tape	W2	3.0	max.	
hole diameter	D0	4.0	± 0.2	
tape thickness	t	0.9	max.	without wires
length of remaining wire after removal of component	L	11.0	max.	