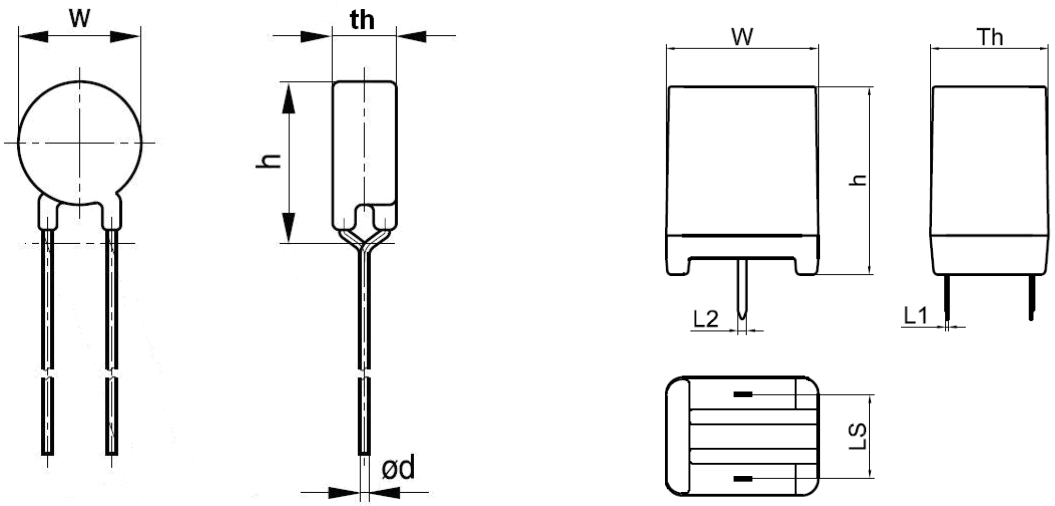
Specification available from: Österreichischer Verband für Elektrotechnik (OVE) Eschenbachgasse 9 A-1010 VIENNA	IEC 60738-1-3 – AT0004 Issue 5/ 2020-07
Electronic Components of assessed quality in accordance with: IEC 60738-1: 2009-07	IEC 60738-1-3: 2008-02 QC 440003
	Directly heated positive step-function temperature coefficient thermistors for current limiting application. Inrush current limiter PTC Thermistors
Assessment level: EZ	Modified ferro-electric ceramic material PTC disk with terminations

Outline drawing (versions see 1.2):



Information on the availability of components qualified to this detail specification is given in the Register of Approvals

1 General data

1.1 Method of mounting

Leaded PTC:

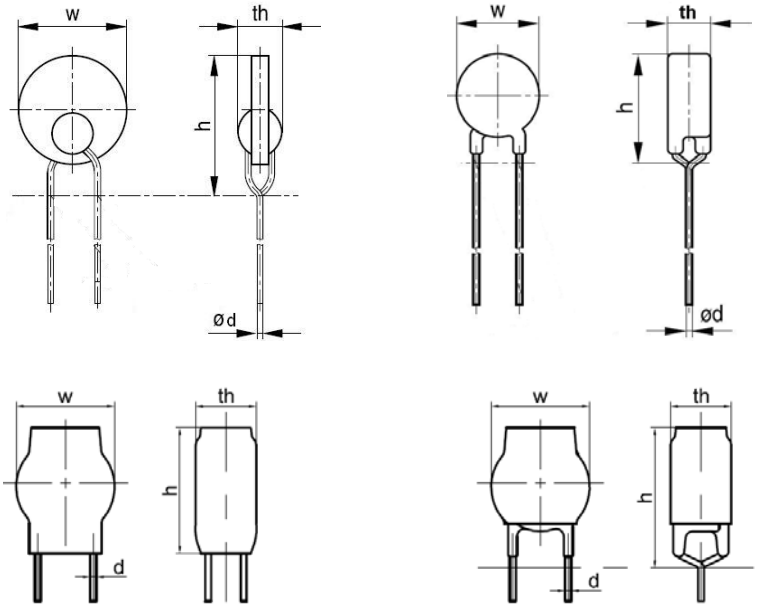
Thermistors are gripped and connected by clips at 20 - 25mm from the body.

Housed PTC :

Thermistors are connected on the lead of the thermistors.

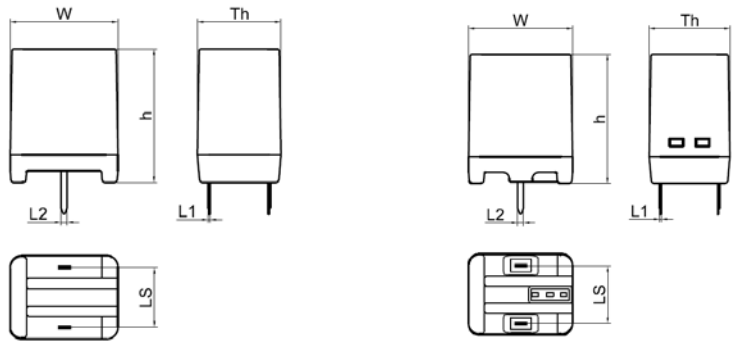
1.2 Dimensions

Leaded PTC (uncoated, coated, shrink tube versions):



Data for the parameters w_{max}, th_{max}, h_{max} and Ød: See tables 1 and 2.
The lead length is valid only for bulk packed components, for taped components IEC 60286-2 applies

Housed PTC (B5910*J* series, B5921*J* series):



Data for parameters w_{max}, th_{max}, h_{max}, LS: See tables 3, respectively 4.

1.3 Coating/ Housing materials

Leaded PTC thermistors are coated with nonisolating lacquer (except B-types: not coated).
Material: Silicone lacquer
Ref. No.: “OHMCOAT AF”, Type 490-(+)
Supplier: Yantai Namics Electronic Materials Co., Ltd

Alternative:
Material: Silicone lacquer
Ref. No.: HYDRO-TAUCHLACK HHF BLAU
Supplier: Akzo Nobel Coatings, GmbH

Shrink tube types:
Material: Polyolefin heat-shrinkable tube secured over coating
Ref. No.: RSFR-H tube black
Supplier: Shenzhen Woer Heat-Shrinkable Material Co.,Ltd

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Housed types B5910*J* series:
Material: Phenolic Molding Compound
Ref. No.: Longlite -T375HF
Supplier: Chang Chun Plastics.Co.,Ltd

Housed types B5921*J* series:
Material: Plastic housing – PBT with glass fiber
Ref. No.: 1403G6 GBK4 /30% PBT
Supplier: Nan Ya Plastics Corporation

1.4 Terminations

The terminations are suitable for soldering.

1.5 Flammability

Not specified.

1.6 Resistance to solvents

Not specified

1.7 Packaging

PTC thermistors are taped according to IEC 60286-2 or bulk packed.

1.8 Electrical data/ratings and characteristics

Upper/lower category temperatures (V = 0): UCT/LCT = -40°C / 125°C
Operating temperature range at V_{max}: T_{op} = -40/85°C
Maximum voltage: V_{max}
Nominal zero-power resistance at 25±1°C (V_{DC} <1.5V): R_{25}
Voltage proof (housed types and B59xxxU*): 1000 V_{AC}
Voltage proof (B59751C1140yzzz): 1500 V_{AC}
Insulation resistance (housed types, B59xxxU* and B59751C1140yzzz): R_{IS} > 500 MOhm
Maximum residual current at V_{max} measured 300s after tripping: I_{res}
Minimum series resistance: 0 Ohm (no series resistance required)
Max. peak-to-peak inrush current: $I_{in\ pp\ max}$
Switching temperature (for information only): T_{sw}
Remark: Under normal operating conditions the PTC temperature will be not exceed T_{sw}

For corresponding ratings see tables 1 to 4.

Table 1

Leaded Disc B5975* series:

Material number[2]	R_{25}	ΔR	T_{SW}	V_{max}	$I_{in\ pp\ max}$	I_{res}	w_{max}[1) 3)]	h_{max}[1) 3)]	th_{max}[1) 3)]	Ød[3)]
	Ohm	%	°C	V	A	mA	mm	mm	mm	mm
B59750x*120yzzz	25	±25	120	280	64	16.0	12.5/ 13/ 14	16.5/ 18/ 19	5/ 5.5/ 7	0.6±0.05
B59751x*120yzzz	50	±25	120	280	30	17.0	12.5/ 13/ 14	16.5/ 18/ 19	7/ 7.5/ 8.5	0.6±0.05
B59751C1140yzzz	50	±25	140	280	30	17.0	12.5/ 15/ 16	17.5/ 19/ 20	7/ 8/ 9	0.8±0.05
B59752x*120yzzz	80	±25	120	280	22	17.0	12.5/ 13/ 14	16.5/ 18/ 19	7/ 7.5/ 8.5	0.6±0.05
B59753x*120yzzz	120	±25	120	440	26	11.0	12.5/ 13/ 14	16.5/ 18/ 19	7/ 7.5/ 8.5	0.6±0.05
B59754x*120yzzz	150	±25	120	440	22	11.0	12.5/ 13/ 14	16.5/ 18/ 19	7/ 7.5/ 8.5	0.6±0.05

[1)] Uncoated/ Coated / Shrink tube version
[2)] See Ordering Code acc. to 1.11
[3)] For customer specific versions (y=B) other values according to related product Data Sheet may be possible.

Table 2

Leaded Disc B594*x1* series

Material number[2]	R_{25}	ΔR	T_{SW}	V_{max}	$I_{in\ pp\ max}$	I_{res}	w_{max}[1) 3)]	h_{max}[1) 3)]	th_{max}[1) 3)]	Ød[3)] Ød[3)]Ød[3)]
	Ohm	%	°C	V	A	mA	mm	mm	mm	mm
B59441x1130yzzz	47	±25	130	440	62	21.0	14.5/ 16/ 17	18.5/ 20.5/ 21.5	7.5/ 8/ 9	0.8±0.05
B59451x1130yzzz	56	±25	130	440	52	21.0	14.5/ 16/ 17	18.5/ 20.5/ 21.5	7.5/ 8/ 9	0.8±0.05
B59412x1130yzzz	120	±25	130	480	32	21.0	14.5/ 16/ 17	18.5/ 20.5/ 21.5	7.5/ 8/ 9	0.8±0.05

[1)] Uncoated/ Coated/ Shrink tube version
[2)] See Ordering Code acc. to 1.11
[3)] For customer specific versions (y=B) other values according to related product Data Sheet may be possible.

Table 3

Housing Type B5910*J* series

Material number[2]	R_{25}	ΔR	T_{SW}	V_{max}	$I_{in\ pp\ max}$	I_{res}	w_{max}	th_{max}	h_{max}	LS	$L1_{max}$	L2
	Ohm	%	°C	V	A	mA	mm	mm	Mm	mm	mm	mm
B59105J*130yzzz	22	±25	130	280	68	9.0	18	14	22.7	10±0.5	0.4	1.0±0.2
B59103J*130yzzz	33	±25	130	280	58	9.0	18	14	22.7	10±0.5	0.4	1.0±0.2
B59107J*130yzzz	56	±25	130	440	52	7.0	18	14	22.7	10±0.5	0.4	1.0±0.2
B59109J*130yzzz	100	±25	130	560	40	6.0	18	14	22.7	10±0.5	0.4	1.0±0.2

[2)] See Ordering Code acc. to 1.11

Table 4

Housing Type B5921*J* series

Material number[2]	R_{25}	ΔR	T_{SW}	V_{max}	$I_{in\ pp\ max}$	I_{res}	w_{max}	th_{max}	h_{max}	LS	$L1_{max}$	L2
	Ohm	%	°C	V	A	mA	mm	mm	mm	mm	mm	mm
B59215J*130yzzz	22	±25	130	280	68	9.0	18.5	14.5	22.7	10±0.5	0.4	1.0±0.2
B59213J*130yzzz	33	±25	130	280	58	9.0	18.5	14.5	22.7	10±0.5	0.4	1.0±0.2
B59217J*130yzzz	56	±25	130	440	52	7.0	18.5	14.5	22.7	10±0.5	0.4	1.0±0.2
B59219J*130yzzz	100	±25	130	560	40	6.0	18.5	14.5	22.7	10±0.5	0.4	1.0±0.2

[2)] See Ordering Code acc. to 1.11

1.9 Related documents

Generic specification

IEC 60738-1: 2009-07, thermistors – directly heated positive step-function temperature coefficient – Part 1: Generic specification

1.10 Marking

The type designation is stamped on coated and housed thermistors.

On the packing of all shipped thermistors there will be a bar code label stating type, part number, quantity, date of manufacture and lot number.

1.11.1 Ordering information

Ordering code: B59XXXx*YYYyzzz+

B59XXXx	Type designation	B59… PTC Thermistor XXX… type family code x… B (uncoated), C (coated), U (coated with shrink tube) J (housing type)
*	Supplement digit type designation (optional)	"0", or omitted.
YYY	Switching temperature	T_{sw} [°C]
y	Version: Standard/Customer	A (standard type), B (customer specific type)
zzz	Packing and customer specifc informations	zzz ... code for packing type and in case of B-types customer specifc information not effecting IECQ specifications (except dimensional ratings may be different according to related product Data Sheet)
+	Processing code (optional)	Can be followed by additional numbers and letters (3 digits) not effecting IEC specifications (processing).

2. INSPECTION REQUIREMENTS

2.1 Procedures

2.1.1 For qualification approval, the procedures shall be in accordance with the generic specification IEC 60738-1, 6.5.4.

2.1.2 For quality conformance inspection the test schedules (tables 1 and 2) include sampling, periodicity severity's and requirements. The formation of inspection lots is covered by 6.5.7 of the generic specification.

In the following tables (item nos. according to the blank detail specification):

1) The Subclause numbers of tests refer to the generic specification IEC 60738-1 and to the data of this specification.

2) Number to be tested: sample size as directly allotted to the code letter for IL in table IIA of IEC 60410 (or IEC 61193-2). Single sampling plan for normal inspection.

3) In these tables:
p = periodicity in months
n = number of devices in the samples
c = the acceptance criterion (permitted number of non-conforming items)
D = indicates a destructive test
ND = indicates a non destructive test
IL = the inspection level

5) The specimens used for this group may, at the discretion of the manufacturer, be used for any subsequent group which is identified as being „destructive".

6) The soldering – solderability and soldering – resistance to heat tests shall only be applied where the thermister has terminations which are appropriate for soldering.

7) Where the terminations are stated to be suitable for printed wiring applications, the appropriate test conditions in IEC 60068 shall apply.

8) The termistors shall be mounted by their normal means.

9) The bump test and the shock test are alternatives. The test selected in the detail specification shell be used.

10) The detail specification shall specify which of the endurance tests in groups C4, C5 and D1 respectively are appropriate to the construction and application of the thermistor (see also item 13).

11) Any deviation from annex B of the generic specification shall be given in the detail specification.

12) 100% testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million ($x10^{-6}$). The sampling level shall be established by the manufacturer. For the calculation of $x\ 10^{-6}$ values any parametric failure shall be counted as non-conforming item. In case one or more non-conforming items occur in a sample, this lot shall be rejected.

13) Deviating from IEC 60738-1 the cycling tests 7.24.1 and 7.24.4 are done with test conditions according operating mode in application, as described below:

In normal operating mode the applied energy is less than C_{th} x ($T_{sw} - T_{amb}$), C_{th} being the typical Heat Capacity of the Thermistor (J/K). To simulate the operating mode the t_{on} time during these cycling tests is calculated as follows: $((1{,}4*V_{max})^2 \times t_{on}) / R_{25} = C_{th} \times (T_{sw} - T_{amb})$. In case that t_{on} calculated is less than 0.1s, than instead t_{on} = 0.1s is used.

TEST SCHEDULE for quality conformance inspection: lot-by-lot

Subclause number and test (see list item 1)	D or ND	Conditions of test (see list item 1)	IL (see list item 3)	n	c	Performance requirements (see list item 1)
GROUP A INSPECTION **Subgroup A0** 7.5 Zero-power resistance R_T	ND	@25°C ±1°C, <1.5V DC	100 % (see list item 12)			According par. 1.8
Subgroup A1 7.4.1 Visual examination	ND		S-4	2)	0	As in 7.4.1
Subgroup A2 7.4.2 Marking 7.4.3 Dimensions (gauging)	ND	Not applicable	S-3	2)	0	As in 7.4.2
GROUP B INSPECTION **Subgroup B1** 7.29 Inrush current 7.27 Residual current	ND	I_{Inrush}@V_{max}, T = 25±3°C I_{res} @V_{max} after 300s, T=25±3°C	S-2	2)	0	According par. 1.8 According par. 1.8
Subgroup B2 7.8 Voltage proof 7.16 Soldering - Solderability	ND	For insulated types only (housed, B59xxxU* and B59751C1140yzzz series) V = see chapt. 1.8, 60±5s Metal balls method (alternatively for B59xxxU* series: Metal foil method) IEC 60068-2-20 Test Ta: soldering bath conditions: - for leaded solder: 235±5°C, 2s - for lead free solder: 245±5°C, 3s	S-2	2)	0	No breakdown/ flashover The terminations shall be uniformly tinned

TEST SCHEDULE for quality conformance inspection: periodic

Subclause number and test (see list item 1)	D or ND	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3) P	N	c	Performance Requirements (see list item 1)
GROUP C INSPECTION						
Subgroup C1A	D	(see list item 6 and 7)	6	5	0	
Part of sample						
7.17 Soldering – resistance to soldering heat		IEC 60068-2-20 Test Tb: soldering bath 260°C soldering time: 10s Visual examination Zero-power resistance				 As in 7.17 ΔR/R: ±5%
7.15 Robustness of terminations		IEC 60068-2-21 - Tensile: Ua F = 10N (for 0,50 < d ≤ 0,80mm) F = 20N (for 0,80 < d ≤ 1,25mm) <u>Only for leaded types:</u> - Bending Ub (Methode 1), 2x 90° F = 5N (for 0,50 < d ≤ 0,80mm) F = 10N (for 0,80 < d ≤ 1,25mm) - Torsion strength Uc (Methode1/ Severity 2): 2x 180° Visual examination Zero-power resistance				 As in 7.15 ΔR/R: ±5%
Subgroup C1B	D		6	5		
Other part of sample						
7.18 Rapid change of temperature		IEC 60068-2-14; Na θ_A = -40°C θ_B = 125°C 5 cycles; t=30min Visual examination Zero-power resistance				 As in 7.18 ΔR/R: ±25%

Table continued

Subclause number and test (see list item 1)	D or ND	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3) P	N	c	Performance Requirements (see list item 1)
7.19 Vibration		IEC 60068-2-6 Frequency range: 10-55Hz Amplitude: 0.75 mm, 98ms^2 Sweep endurance: Total duration 6h (2h in x,y,z) Final measurements: Visual examination Zero-power resistance				As in 7.19 ΔR/R: ±5%
7.20 Bump (or shock, see list item 9)		Not specified				
7.21 Shock (or bump, see list item 9)		(see list item 8) IEC 60068-2-27 Standard condition (except for below types): Acceleration: 500 m/s^2; t = 11ms Number of shocks: 6 x 3 pulses For B59750x*, B594*x1* series, B5921*J*: Acceleration: 400 m/s^2; t = 6ms Number of shocks: 6 x 5000 pulses Visual examination Zero-power resistance				As in 7.21 ΔR/R: ±5%
Subgroup C1 **Combined sample of specimens of subgroups C1A and C1B**	D		6	10		
7.22 Climatic sequence		IEC 60068-2-30 Db, IEC60068-2-1 A, IEC 60068-2-2 B (low air pressure test not applicable) Category: -40/125/56 - Dry heat: T = 125±2°C, t = 16h - Damp heat, cyclic, first cycle - Cold: T = -40±2°C, t = 2h - Damp heat, cyclic, remaining 5 cycles Visual examination Zero-power resistance For insulated types only (housed, B59xxxU* and B59751C1140yzzz series): - Insulation resistance 7.7: V = 100±15V_{DC}, t = 60±5s - Voltage proof 7.8: V = see chapt. 1.8, 60±5s Metal balls method (alternatively for B59xxxU* series: Metal foil method)				As in 7.22 ΔR/R: ±10% R_{IS} > 500 MOhm No breakdown/ flashover

Table continued

Subclause number and test (see list item 1)	D or ND	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3) P	N	c	Performance Requirements (see list item 1)
Subgroup C3 7.4.4 Dimensions (detail)	ND	(see list item 5) Leaded types: w_{max}, th_{max}, h_{max}, Ød Housed types: w_{max}, th_{max}, h_{max}, LS, d1, d2	6	10	0	According par. 1.2
Subgroup C5 7.24.3 Endurance at maximum operating temperature and maximum voltage	ND	Temperature: T = T_{op_max} ±2°C V = V_{max} Duration: 1000h Examination at 168 h and 500 h Zero-power resistance Visual examination Zero-power resistance I_{Inrush}@V_{max}, T = 25±3°C I_{res} @V_{max} after 300s, T=25±3°C For insulated types only (housed, B59xxxU* and B59751C1140yzzz series): - Insulation resistance 7.7 V = 100±15V_{DC}, t = 60±5s Metal balls method (alternatively for B59xxxU* series: Metal foil method)	6	10	0	ΔR/R: ±25% As in 7.24.3 ΔR/R: ±25% According par. 1.8 R_{IS} > 500 MOhm
GROUP D INSPECTION **Subgroup D1** 7.24.1 Endurance at room temperature (cycling, failure mode)	D	(see list item 10, 13) Duration: 10 cycles (leaded types), 100 cycles (housed types) V_{max}, I_{Inrush}, t_{on} (failure mode)=10s, t_{off} >120% $\tau_{therm.}$. In accordance with El. Data Final measurements: Visual examination Zero-power resistance I_{Inrush}@V_{max}, T = 25±3°C I_{res} @V_{max} after 300s, T=25±3°C For insulated types only (housed, B59xxxU* and B59751C1140yzzz series): - Insulation resistance 7.7 V = 100±15V_{DC}, t = 60±5s Metal balls method (alternatively for B59xxxU* series: Metal foil method)	12	10	0	As in 7.24.1 ΔR/R: ±25% According par. 1.8 R_{IS} > 500 MOhm

Table continued

Subclause number and test (see list item 1)	D or ND	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3) P	N	c	Performance Requirements (see list item 1)
Subgroup D2 7.24.4 Cold environmental electrical cycling (operating mode)	D	Duration: 1000 cycles V_{max}, I_{Inrush}, t_{on} (see item 13), t_{off} >300% $\tau_{therm.}$ T = T_{op_min} ±2°C Final measurements: Visual examination Zero-power resistance	12	10	0	As in 7.24.4 ΔR/R: ±25%
Subgroup D3 7.24.5 Thermal runaway	D	Applied voltage: 200% V_{max} Starting with V_{max} and increase 10%V_{max}, d = 2min/step Final measurements: Visual examination	12	10	0	ΔR/R: ±25% As in 7.24.5
Subgroup D4 7.23 Damp heat, steady state	D	IEC 60068-2-78 test Cab Voltage: 0V Temperature: 40°C ±2°C Humidity: 93% RH +2 –3%RH Duration: 56d Visual examination Zero-power resistance Temperature: 25°C ±1°C Voltage: <1.5V DC For insulated types only (housed, B59xxxU* and B59751C1140yzzz series): - Insulation resistance 7.7 V = 100±15V_{DC}, t = 60±5s - Voltage proof 7.8 V = see chapt. 1.8, 60±5s Metal balls method (alternatively for B59xxxU* series: Metal foil method)	12	10	0	As in 7.23 ΔR/R: ±10% R_{IS} > 500 MOhm No breakdown/ flashover