


Specification available from: Österreichischer Verband für Elektrotechnik (OVE) Eschenbachgasse 9 A-1010 VIENNA	IEC 60738-1-1 – AT0002 Issue 1 / 2023-01 QC 440001 AT0001
Electronic Components of assessed quality in accordance with: IEC 60738-1: 2022-10	IEC 60738-1-1: 2008-02 QC 440001
	Directly heated positive step-function temperature coefficient thermistors for current limiting applications. <u>Overcurrent Protection PTC</u>
Assessment level: EZ	Modified ferro-electric ceramic material parts with terminations
Outline drawings: SMD PTCs EIA case size 1210 	

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

1 General data

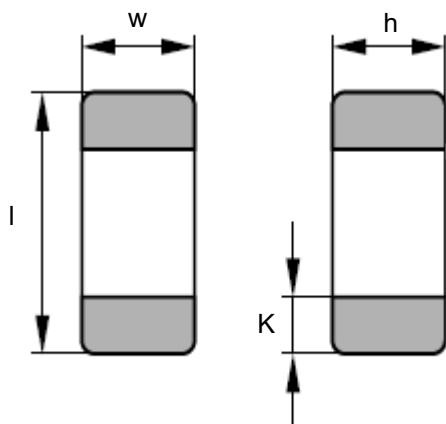
1.1 Method of mounting

If not otherwise specified the SMD Thermistors shall be soldered as follows, according to IEC60738-1, 5.40.:

- Soldering on 1,6 mm thick epoxide woven glass fabric laminated printed board.
- Method of soldering: Reflow. Peaktemperature 260 °C.
- Solder paste: Sn96,5-Ag3,0-Cu0,5.

Note: After soldering a recovery time of 120 h must be considered (before measurements on PCB).

1.2 Dimensions



Case size	Length l [mm]	Width w [mm]	Height h [mm]	Termination Length K [mm]
1210	$3,2 \pm 0,2$	$2,5 \pm 0,2$	$1,6 \pm 0,2$	$0,75 + 0 / - 0,6$

1.3 Coating

Non-coated PTC thermistors.

1.4 Terminations

The terminations are suitable for soldering.

1.5 Flammability

Not specified.

1.6 Resistance to solvents

Not applicable.

1.7 Packaging

PTC SMD thermistors are taped according to IEC 60286-3.

1.8 Electrical data/ratings and characteristics

General technical data

Maximum operating voltage	V_{max}	according to rating table
Switching cycles	N	100
Operating temperature range (V = 0V) Lower category temperature Upper category temperature	LCT UCT	-40°C +125°C
Minimum operating temperature (V ≤ V_{max})	T_{op_min}	-40°C
Maximum operating temperature (V ≤ V_{max})	T_{op_max}	+85°C
Zero power resistance @25°C¹⁾	R_T	according to rating table
Tolerance of R_T	ΔR_T	± 35%
Tripping temperature (for information only)	T_b	according to rating table
Tripping current	I_t	according to rating table
Maximum non tripping current	I_{nt}	according to rating table
Maximum overload current	I_{max}	according to rating table

¹⁾ Measured at Temperature: 25°C ±1 °C and Voltage: <1.5 V DC

SMD PTC EIA case size 1210 overcurrent protection							
Ordering code	V_{max}	I_{nt}	I_t	I_{max} (V = V _{max})	R_T	R_{min}	T_b
	V	mA	mA	A	Ω	Ω	°C
B59907A0120B*	265	12	22	0,15	1500	640	120

1.9 Related documents

Generic specification

IEC 60738-1: 2022-10, thermistors – directly heated positive step-function temperature coefficient – Part 1: Generic specification

1.10 Marking

No marking is stamped on SMD PTC parts.

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

1.11 Ordering information

The ordering code consists of 3 blocks:

Ordering code: B59xxx-A0yyy-A(B)zzz+

1 st block:	type designation	B59xxx	B59... PTC Thermistor xxx... type size code: 606, 607, 707, 807, 907 size 1210
2 nd block	tripping temperature	A0yyy	yyy ... T _b [°C]
3 rd block:	Packing, processing, customer specific information	A(B)zzz+	zzz ... code for packing / processing and in case of B-types customer specific information not effecting IECQ specifications. + ... can be followed by additional numbers and letters (3 digits) not effecting IEC specifications.

2. INSPECTION REQUIREMENTS

2.1 Procedures

For qualification approval, the procedures shall be in accordance with the generic specification IEC 60738-1, par. Q.6.4.

For quality conformance inspection the test schedules include sampling, periodicity severities and requirements. The formation of inspection lots is covered by par. Q.6.7 of the generic specification.

The following list applies to the test schedules developed 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 (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

4) The temperature at which the zero-power resistance shall be measured is the temperature specified in the detail specification. This temperature shall be stated, where required, in the test schedule.

5) Data for conditions of test are defined in the detail specification.

7) 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".

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

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

11) The thermistors shall be mounted by their normal means.

12) 100% testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million ($\times 10^{-6}$). The sampling level shall be established by the manufacturer. For the calculation of $\times 10^{-6}$ 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.

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	n	c	Performance requirements (see list item 1)
			(see list item 3)			
GROUP A INSPECTION						
Subgroup A0 6.1 Zero-power resistance R_T Zero-power resistance R_T $T = 25 \pm 1 \text{ }^\circ\text{C}$, $V < 1.5 \text{ V DC}$						
Subgroup A1 7.1.1 Visual examination						
Subgroup A2 7.1.2 Marking 7.1.3 Dimensions (gauging)						
GROUP B INSPECTION						
Subgroup B1 6.11 Tripping current $T = 25 \pm 1 \text{ }^\circ\text{C}$ I_t : according to par. 1.8 $t_{t \text{ max}} : 60 \text{ s}$ 6.13 Residual current (if specified) Not applicable 6.12 Maximum non-tripping current $T = 25 \pm 1 \text{ }^\circ\text{C}$ I_{nt} : according to par. 1.8 $t_{nt \text{ min}} : 600 \text{ s}$						
Subgroup B2 6.4 Voltage proof Not applicable 9.1 Soldering - Solderability according to IEC 60068-2-58: Test Td1: Pb-free reflow soldering $T_{\text{Peak}} = 235 +0/-5 \text{ }^\circ\text{C}$, $t_{\text{Peak}} = 10 \text{ s}$ 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)			Performance Requirements (see list item 1)
			p	n	c	
GROUP C INSPECTION						
Subgroup C1A						
Part of sample						
9.2 Soldering – resistance to soldering heat	D	according to IEC 60068-2-58: Test Td2: Pb-free reflow soldering $T_{Peak} = 260 +5/-0 \text{ } ^\circ\text{C}$, $t_{Peak} = 30...40 \text{ s}$, 3 times Zero-power resistance R_T $T = 25 \pm 1 \text{ } ^\circ\text{C}$, $V < 1.5 \text{ V DC}$ Visual examination (Minimum period of recovery after soldering: $t_{min} = 120 \text{ h}$)	6	5	0	$\Delta R_T/R_T: \pm 20 \%$ No visible damage
7.5 Robustness of termination – Shear test		according to IEC 60068-2-21: Test Ue3: Force $F = 5 \text{ N}$, $t = 10 \pm 1 \text{ s}$. Zero-power resistance R_T $T = 25 \pm 1 \text{ } ^\circ\text{C}$, $V < 1.5 \text{ V DC}$ Visual examination				$\Delta R_T/R_T: \pm 25 \%$ No visible damage
7.6 Robustness of termination – Substrate bending test		according to IEC 60068-2-21: Test Ue1: Bending $d = 2 \text{ mm}$, $t = 20 \pm 1 \text{ s}$. One bending. Zero-power resistance R_T $T = 25 \pm 1 \text{ } ^\circ\text{C}$, $V < 1.5 \text{ V DC}$ Visual examination				$\Delta R_T/R_T: \pm 10 \%$ No visible damage
Subgroup C1B						
Other part of sample						
8.1 Rapid change of temperature	D	according to IEC 60068-2-14: Test Na: $T_1 = -55 \text{ } ^\circ\text{C}$ $T_2 = +125 \text{ } ^\circ\text{C}$ 100 cycles; $t_{dwell} = 30 \text{ min}$ Zero-power resistance R_T $T = 25 \pm 1 \text{ } ^\circ\text{C}$, $V < 1.5 \text{ V DC}$ Visual examination	6	5	0	$\Delta R_T/R_T: \pm 10 \%$ No visible damage

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)			Performance Requirements (see list item 1)
			p	n	c	
7.3 Vibration		according to IEC 60068-2-6: Test Fc: Frequency range: 10....2000 Hz Amplitude: 0.75 mm Acceleration: 50 m/s ² Sweep endurance: Total duration 12h (3 x 4 h in x,y,z) Zero-power resistance R _T T = 25 ±1 °C, V < 1.5 V DC Visual examination	6	5	0	$\Delta R_T/R_T: \pm 5 \%$ No visible damage
7.4 Shock		according to IEC 60068-2-27: Test Ea: Pulse shape: half sine Acceleration: 400 m/s ² ; t = 6 ms Number of shocks: 6 x 5000 Zero-power resistance R _T T = 25 ±1 °C, V < 1.5 V DC Visual examination				$\Delta R_T/R_T: \pm 5 \%$ No visible damage
Subgroup C1 Combined sample of specimens of subgroups C1A and C1B	D		6	10	0	
8.2 Climatic sequence		according to IEC 60068-2-30: Test Db: IEC 60068-2-1 A, IEC 60068-2-2 B: (low air pressure test not applicable) Category: -40 °C / +125 °C / 56 - Dry heat: T = +125 °C, t = 16 h - Damp heat: cyclic, first cycle - Cold: T = -40 °C, t = 2 h - Damp heat, cyclic, remaining 5 cycles Zero-power resistance R _T T = 25 ±1 °C, V < 1.5 V DC Visual examination				as in 8.2 $\Delta R_T/R_T: \pm 10 \%$ No visible damage

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)			Performance Requirements (see list item 1)
			p	n	c	
Subgroup C3 7.1.4 Dimensions (detail)	ND	l, w, h, K	6	10	0	acc. to par. 1.2
Subgroup C4 8.4.2 Endurance at upper category temperature	ND	T = +125 ±2 °C V = 0 V Duration: 1000 h Examination at 300 h Zero-power resistance R _T T = 25 ±1 °C, V < 1.5 V DC Examination at 1000 h Zero-power resistance R _T T = 25 ±1 °C, V < 1.5 V DC Visual examination	6	10	0	as in 8.4.2 ΔR _T /R _T : ±25 % ΔR _T /R _T : ±25 % No visible damage
Subgroup C5 8.4.3 Endurance at maximum operating temperature and maximum voltage	ND	T = +85 ±2 °C V = V _{max} Duration: 1000 h Examination at 168 h and 500 h Zero-power resistance R _T T = 25 ±1 °C, V < 1.5 V DC Examination at 1000 h Zero-power resistance R _T T = 25 ±1 °C, V < 1.5 V DC Visual examination	6	10	0	as in 8.4.3 ΔR _T /R _T : ±25 % ΔR _T /R _T : ±25 % No visible damage

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)			Performance Requirements (see list item 1)
			p	n	c	
GROUP D INSPECTION						
Subgroup D1 8.4.1 Endurance at room temperature (cycling)	D	Duration: 100 cycles Applied voltage: V_{max} and I_{max} $T = 25 \pm 1 \text{ }^\circ\text{C}$ Final measurements: Zero-power resistance R_T $T = 25 \pm 1 \text{ }^\circ\text{C}$, $V < 1.5 \text{ V DC}$ Visual examination	12	10	0	as in 8.4.1 $\Delta R_T/R_T: \pm 25 \%$ No visible damage
Subgroup D2 8.4.4 Cold environmental electrical cycling	D	Duration: 1000 cycles Applied voltage: V_{max} and $I > I_t$ $T = -40 \pm 2 \text{ }^\circ\text{C}$ Final measurements: Zero-power resistance R_T $T = 25 \pm 1 \text{ }^\circ\text{C}$, $V < 1.5 \text{ V DC}$ Visual examination	12	10	0	as in 8.4.4 $\Delta R_T/R_T: \pm 25 \%$ No visible damage
Subgroup D3 8.4.5 Thermal runaway	D	Applied voltage: $200 \% V_{max}$ Starting with V_{max} and increase $10 \% V_{max}$, $d = 2 \text{ min/step}$ Final measurements: Visual examination	12	10	0	as in 8.4.5 No visible damage
Subgroup D4 8.3 Damp heat, steady state	D	according to IEC 60068-2-78: test Ca: Voltage: 0 V Temperature: $40 \pm 2 \text{ }^\circ\text{C}$ Humidity: $93 +2 -3 \% \text{ RH}$ Duration: 56 d Zero-power resistance R_T $T = 25 \pm 1 \text{ }^\circ\text{C}$, $V < 1.5 \text{ V DC}$ Visual examination	12	10	0	as in 8.3 $\Delta R_T/R_T: \pm 10 \%$ No visible damage