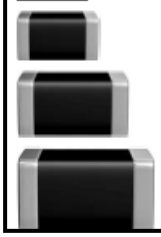
<table>
<tr><td>Specification available from:

Österreichischer Verband für
Elektrotechnik (OVE)
Eschenbachgasse 9
A-1010 VIENNA</td><td>IEC 60738-1-4 – AT0001
Issue 6 / 2019-05

QC 440004</td></tr>
<tr><td rowspan="2">Electronic Components of assessed quality in accordance with:

IEC 60738-1: 2009-07
IEC 60730-1, Annex J15, J17: 2010-03</td><td>IEC 60738-1-4: 2008-02

QC 440004</td></tr>
<tr><td>Directly heated positive step-function temperature coefficient thermistors for sensing application (Limit temperature sensors)</td></tr>
<tr><td rowspan="2">Outline drawing: SMD PTCs EIA sizes 0402, 0603, 0805.

<table><tr><th>Type</th><th>Case size</th></tr><tr><td>SMD
  </td><td>0402, 0603, 0805</td></tr></table></td><td>Modified ferro-electric ceramic material parts for over-temperature protection</td></tr>
<tr><td>Assessment level: EZ</td></tr>
</table>

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

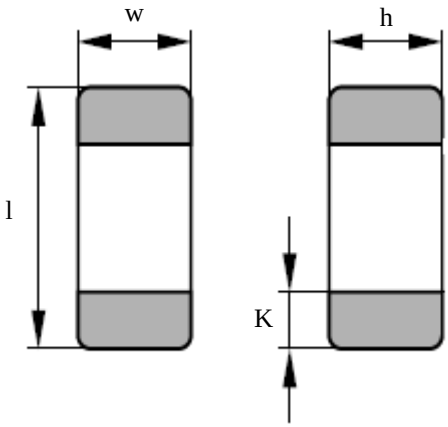
1 GENERAL DATA

1.1 Method of mounting

If not otherwise specified the SMD Thermistors shall be soldered as follows, according to IEC60738-1, 7.30.:
- 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 120h must be considered (before measurements on PCB).

1.2 Dimensions



Case size	Length l [mm]	Width w [mm]	Hight h [mm]	Termination Length K [mm]
0402	1,0 ± 0,1	0,5 ± 0,05	0,5 ± 0,05	0,25 ± 0,15
0603	1,6 ± 0,15	0,8 ± 0,1	0,8 ± 0,1	0,35 ± 0,15
0805	2,0 ± 0,2	1,25 ± 0,2	0,8 ± 0,2	0,75 – 0,6

1.3 Coating

Non-coated PTC thermistors.

1.4 Terminations

The terminations are suitable for soldering.

1.5 Flammability

Not applicable.

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

Max. operating DC voltage	**V_{max}**	32V
Lower category temperature, Minimum operating temperature ($V \leq V_{max}$)	**LCT, T_{opmin}**	-40°C
Upper category temperature, Maximum operating temperature ($V \leq V_{max}$)	**UCT, T_{opmax}**	125°C or $T_{sense,1}$ +25°C whichever is higher
Rated resistance @25°C	**R_R**	According rating table
Sensing Temperature	**T_{sense}**	According rating table
Maximum Power during measurement[1)]	**P_{max}**	2 mW for case size 0402 4 mW for case size 0603 6 mW for case size 0805

1) Note: In order to limit self heating effects, the electrical power during measurement should not exceed the indicated limits.

Detailed electrical ratings

EIA case size 0402				**Superior series**
Ordering code	**R_R** **Ω**	**ΔR_R** **%**	**$T_{sense,1}$ (@ 4,7 kΩ)** **°C**	**$T_{sense,2}$ (@ 47 kΩ)** **°C**
B59421A0075*	470	± 50	75 ± 5	-
B59421A0085*	470	± 50	85 ± 5	-
B59421A0095*	470	± 50	95 ± 5	-
B59421A0105*	470	± 50	105 ± 5	-
B59421A0115*	470	± 50	115 ± 5	-
B59451A0115*	540	± 30	115 ± 5	-
B59421A0125*	470	± 50	125 ± 5	-
B59421A0135*	470	± 50	135 ± 5	-

EIA case size 0603				**Superior series**
Ordering code	**R_R** **Ω**	**ΔR_R** **%**	**$T_{sense,1}$ (@ 4,7 kΩ)** **°C**	**$T_{sense,2}$ (@ 47 kΩ)** [1)] **°C**
B59641A0075*	470	± 50	75 ± 5	90 ± 7
B59641A0085*	470	± 50	85 ± 5	100 ± 7
B59641A0095*	470	± 50	95 ± 5	110 ± 7
B59641A0105*	470	± 50	105 ± 5	120 ± 7
B59641A0115*	470	± 50	115 ± 5	130 ± 7
B59641A0125*	470	± 50	125 ± 5	140 ± 7
B59641A0135*	470	± 50	135 ± 5	150 ± 7
B59641A0145*	470	± 50	145 ± 5	-

1) Only specified for PTC Series B59641A0***A062

EIA case size 0805						**Superior series**
Ordering code	**R_R** **Ω**	**ΔR_R** **%**	**$T_{sense,1}$** **°C**	**$R_{Tsense,1\ -5°C}$** **kΩ**	**$R_{Tsense,1\ +5°C}$** **kΩ**	**$R_{Tsense,1\ +15°C}$** **kΩ**
B59721A0070*	680	± 50	70	≤ 5,7	≥ 5,7	≥ 40 [1)]
B59721A0080*	680	± 50	80	≤ 5,7	≥ 5,7	≥ 40 [1)]
B59721A0090*	680	± 50	90	≤ 5,5	≥ 13,3	≥ 40
B59721A0100*	680	± 50	100	≤ 5,5	≥ 13,3	≥ 40
B59721A0110*	680	± 50	110	≤ 5,5	≥ 13,3	≥ 40
B59721A0120*	680	± 50	120	≤ 5,5	≥ 13,3	≥ 40
B59721A0130*	680	± 50	130	≤ 5,5	≥ 13,3	≥ 40

[1)] R ($T_{sense,1}$ +25°C)

1.9 Normative references

IEC 60738-1, thermistors – directly heated positive step-function temperature coefficient – Part 1: Generic specification.
IEC 60730-1, Annex J: Automatic electrical controls for household and similar use –
Part 1: General requirements. Requirements for controls using thermistors.

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+

1st block:	type designation	B59xxx	B59… PTC Thermistor xxx… type size code: 421, 451 size 0402 641 size 0603 721 size 0805
2nd block	sensing temperature	A0yyy	yyy … T_{sense} [°C]
3rd block:	Packing, processing, customer specific information	A(B)zzz+	zzz ... code for packing / processing and in case of B-types customer specifc 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

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

2.2.2 For quality conformance inspection has been used 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.

The following list applies to the test schedules developed in tables 1 and 2.

1) The Subclause numbers of tests and perfomance requirements 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 /alternatively 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-confor. items)
D = indicates a destructive test
ND = indicates a non destructive test
IL = is 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) 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 60068-2-58 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 shall 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 termistor.

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.

Table 1- 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** 7.5 Zero-power resistance R_R	ND	Zero-power resistance R_{25} P_{max} according par. 1.8	100 %			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 Not applicable	S-3	2)	0	
GROUP B INSPECTION **Subgroup B1** 7.5 Zero-power rated resistance R_{25} 7.9 Functioning resistance R_{NF} at T_{NF} 7.27 Residual current (if specified)	ND	 R@25°C ±2°C $R@T_{sense,1}\pm\Delta T$, respectively if specified: $R@T_{sense,2}\pm\Delta T$. according par. 1.8 P_{max} according par. 1.8 Not applicable	S-2	2)	0	According par. 1.8
Subgroup B2 7.8 Voltage proof 7.16 Soldering - Solderability	ND	 Not applicable IEC 60068-2-58 Reflow method (Pb-free solder): T_{Peak} = 235 +0/-5°C t_{Peak} = 10s.	S-2	2)	0	 The terminations should be uniformly tinned.

Table 2- 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 60068-2-58 Reflow soldering with peak temperature 260°C: T_{Peak} = 260±5°C t_{Peak} = 20s Zero-power resistance R_{25} Visual examination Remark: Minimum period of recovery after soldering: t_{min} = 120h.				$\Delta R_{25}/R_{25}$: ±20% No visible damage
7. 31 Robustness of termination – Shear test		According to IEC 60068-2-21 Test Ue3: Force F = 5 N, t = 10±1s. Zero-power resistance R_{25} Visual examination				$\Delta R_{25}/R_{25}$: ±10% No visible damage
7. 32 Robustness of termination - Bord flex		According to IEC 60068-2-21 Test Ue1: Bending d = 2 mm, t = 20±1s. One bending. Zero-power resistance R_{25} Visual examination				$\Delta R_{25}/R_{25}$: ±10% No visible damage
Subgroup C1B	D		6	5	0	
Other part of sample						
7.18 Rapid change of temperature		IEC 60068-2-14; Na T1 = -40°C T2 = T_{opmax}±2°C 5 cycles; t=30min Zero-power resistance R_{25} Visual examination				$\Delta R_{25}/R_{25}$: ±10% No visible damage

Table 2- 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, Fc Frequency range: 10 .... 2000 Hz Amplitude: 0.75 mm Acceleration: 98 m/s^2 Sweep endurance: Total duration 6h (3x2h in x,y,z) Zero-power resistance R_{25} Visual examination				 $\Delta R_{25}/R_{25}$: ±10% No visible damage
7.20 Bump		IEC 60068-2-27, Ea Acceleration: 400 m/s^2; t = 6ms Number of shocks: 6 x 5000 (see list item 8) Zero-power resistance R_{25} Visual examination				 $\Delta R_{25}/R_{25}$: ±10% No visible damage
7.21 Shock (or bump, see list item 9)		Not specified				
Subgroup C1 **Combined sample of specimens of subgroups C1A and C1B**	D		6	10	0	
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/T_{opmax} /56 - Dry heat: T = T_{opmax} ±2°C, t = 16h - Damp heat, cyclic, first cycle - Cold: T = -40±2°C, t = 2h - Damp heat, cyclic, remaining 5 cycles Zero-power resistance R_{25} Visual examination				 $\Delta R_{25}/R_{25}$: ±20% No visible damage

Table 2- 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 C2 7.11 Responce time by ambient temperature t_a (if specified)	ND	Not specified				
7.12 Responce time by power change t_b (if specified)		Not specified				
Subgroup C3 7.6 Temperature coefficient of resistance (if applicable)	ND	Not applicable.				
7.4.4 Dimensions (detail)		l, w, h, K	6	10	0	According par. 1.2
7.10 Dissipation factor at Umax (if specified) (see list item 11)		Not specified				
Subgroup C4 7.24.2 Endurance at upper category temperature (J.17.18.3.1, J.17.18.3.2, acc. IEC60730-1)	ND	IEC 60068-2-2 Test B: $T = T_{opmax}$ ±2°C t = 1000h Examination at 168 h, 500 h and at 1000h: Zero-power resistance R_{25} Visual examination	6	10	0	$\Delta R_{25}/R_{25}$: ±20% No visible damage
GROUP D INSPECTION **Subgroup D1** 7.24.1 Endurance at room temperature (cycl.) (J.17.18.2 acc. IEC60730-1)	D	(see list item 10) 100 cycles Applied voltage: V_{max} Zero-power resistance R_{25} Visual examination	12	10	0	$\Delta R_{25}/R_{25}$: ±10% No visible damage

Table 2- 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 7.24.3 Endurance at maximum operating temperature and maximum voltage	D	IEC 60068-2-2, B T = Topmax ±2°C V = Vmax, t = 1000h Examination at 168 h, 500 h and at 1000 h Zero-power resistance R25 Visual examination	12	10	0	$\Delta R_{25}/R_{25}$: ±20% No visible damage
Subgroup D4 7.23 Damp heat, steady state	D	IEC 60068-2-78, Ca T = 40±2°C, r.H. = 93 (+2/-3)% t = 56d Zero-power resistance R_{25} Visual examination	12	10	0	$\Delta R_{25}/R_{25}$: ±10% No visible damage

Table 3- Additional requirements according IEC 60730-1, Annex J.

Subclause number and test	D or ND	Conditions of test	Sample size and acceptance criterion (see list item 3) P	N	c	Performance Requirements
J17.18.4 Cold environmental thermal cycling (7.24.4 acc. IEC60738-1)	D	IEC 60068-2-14; Na T1 = -40°C, T2 = T_{opmax}±2°C Applied voltage: V_{max} 1000 cycles; t = 15min Zero-power resistance R_{25} Visual examination	12	10	0	$\Delta R_{25}/R_{25}$: ±25% No visible damage
J.17.18.5 Thermal runaway (7.24.5 acc. IEC60738-1)	D	200% V_{max} Starting with V_{max} and increase 10%V_{max}, t = 2min/step Visual examination	12	10	0	No visible damage. There shall be no electrical or mechanical breakdown, expulsion of particles, or evidence of risk of fire or electrical shock.