

## NTC thermistors, special long lead sensors

**2322 641 2/3/4....**

### FEATURES

- Accurate over wide temperature range
- High stability
- Excellent price/performance ratio.

### APPLICATION

Temperature sensing and control.

### DESCRIPTION

These thermistors have a negative temperature coefficient. The epoxy-coated type (2322 641 2....) consists of a chip with UL wire and is lacquered and insulated with black epoxy.

The water-resistant type (2322 641 3....) and the brass-pipe type (2322 641 4....) are suitable for application in various environmental conditions.

### QUICK REFERENCE DATA

PARAMETER	VALUE	UNIT
Resistance value at 25 °C ( $R_{25}$ )	2.2 to 100	kΩ
Tolerance on $R_{25}$ -value	±3	%
Tolerance on $B_{25/85}$ -value	±1.5 or ±0.75	%
Maximum dissipation	250	mW
Operating temperature range: at zero dissipation (continuously)	-40 to +85	°C
at maximum dissipation	0 to +50	°C
Climatic category	40/085/56	
Total length (L); note 1 and Figs 1 to 2	400 ±10	mm
Lead wire; note 1	UL-2468.AWG24 wire	
Mass: 2322 641 2....	≈4	g
2322 641 3....	≈6	g
2322 641 4....	≈6	g

### Note

1. Wire length and wire type are optional on request. The products can be provided with a connector on request.

### ORDERING INFORMATION

**Table 1**  $R_{25}$ -values and catalogue numbers; note 1

$R_{25}$ (kΩ)	$B_{25/85}$ -VALUE	CATALOGUE NUMBER 2322 641 .... <sup>(2)</sup>		
		EPOXY-COATED TYPE	WATER-RESISTANT TYPE	BRASS-PIPE TYPE
2.2	3977 K ±0.75%	26222	36222	46222
5	3977 K ±0.75%	26502	36502	—
10	3977 K ±0.75%	26103	36103	46103
47	4090 K ±1.5%	26473	36473	—
100	4190 K ±1.5%	26104	36104	46104

### Notes

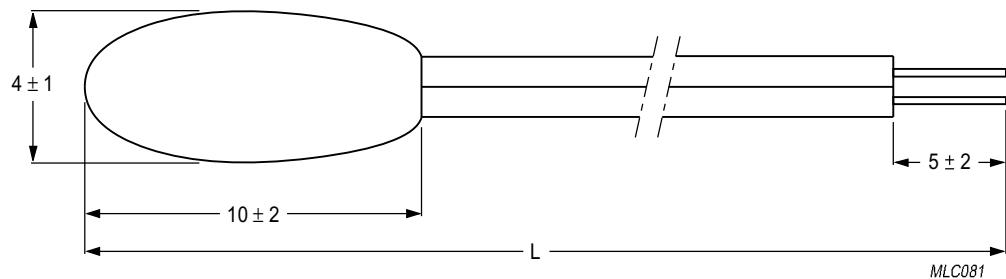
1. Other values based on the 2322 640 0.... series are available on request.
2. The specified catalogue numbers refer to products with L = 400 mm, without connector and adopt UL-2468.AWG24 wire.

### MARKING

UL mark on wire, no mark on body.

**NTC thermistors,  
special long lead sensors**

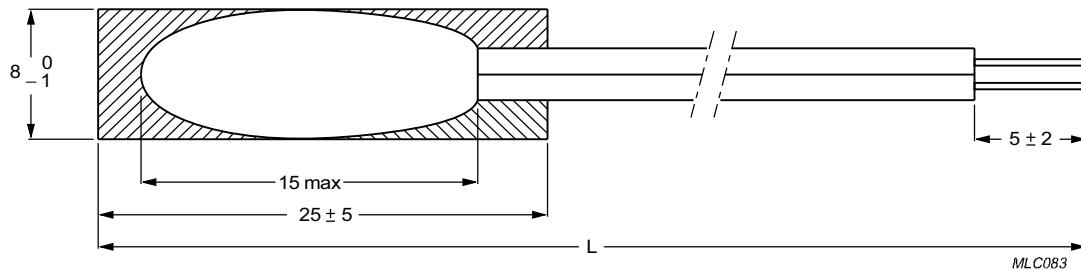
2322 641 2/3/4....

**MECHANICAL DATA**

Dimensions in mm.

L =  $400 \pm 10$  mm. Other wire lengths available on request.

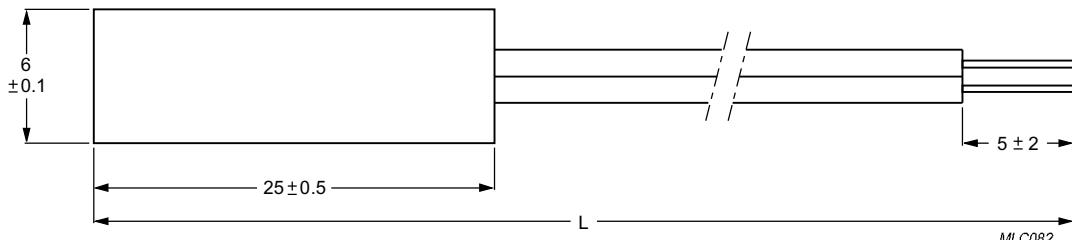
Fig.1 Epoxy-coated type 2322 641 2....



Dimensions in mm.

L =  $400 \pm 10$  mm. Other wire lengths available on request.

Fig.2 Water-resistant type 2322 641 3....



Dimensions in mm.

L =  $400 \pm 10$  mm. Other wire lengths available on request.

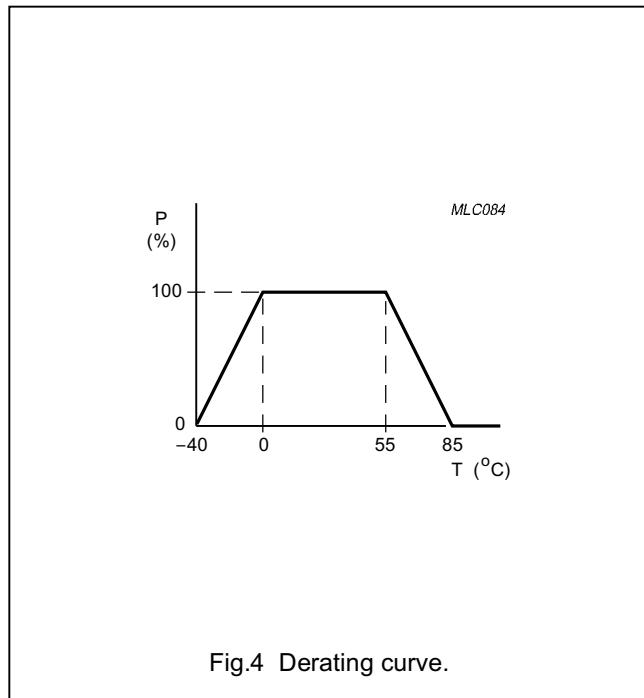
Fig.3 Brass-pipe type 2322 641 4....

# NTC thermistors, special long lead sensors

2322 641 2/3/4....

**ELECTRICAL CHARACTERISTICS**

PARAMETER	VALUE	UNIT
Resistance value at 25 °C ( $R_{25}$ )	2.2 to 470	kΩ
Tolerance on $R_{25}$ -value	±3	%
Tolerance on $B_{25/85}$ -value	±1.5 or ±0.75	%
Maximum dissipation	250	mW
Dissipation factor:		
2322 641 2....	6.0	mW/K
2322 641 3....	8.0	mW/K
2322 641 4....	6.0	mW/K
Response time; note 1:		
2322 641 2....	≈7	s
2322 641 3....	≈15	s
2322 641 4....	≈10	s

**Derating****Note**

1. Response time in silicone oil MS 200/50. This is the time needed for the sensor to reach 63.2% of the total temperature difference when subjected to a temperature change from 25 °C in air to 85 °C in oil.

**NTC thermistors,  
special long lead sensors**

**2322 641 2/3/4....**

**R-T characteristics**

**Table 2** Resistance values at intermediate temperatures

$T_{amb}$ (°C)	$R_T/R_{25}$	$\Delta R$ DUE TO B-TOLERANCE (%)	TC (%/K)	$R_{25}$ (kΩ)		
				2322 641 2/3/4 ....; see Table 4, note 1		
				.6222	.6502	.6103
-40	33.21	2.66	6.57	73.06	166.1	332.1
-35	23.99	2.41	6.36	52.78	120.0	240.0
-30	17.52	2.17	6.15	38.55	87.60	175.2
-25	12.93	1.94	5.95	28.44	64.65	129.3
-20	9.636	1.71	5.76	21.20	48.18	96.36
-15	7.250	1.50	5.58	15.95	36.25	72.50
-10	5.505	1.29	5.40	12.11	27.52	55.05
-5	4.216	1.08	5.24	9.275	21.08	42.16
0	3.255	0.89	5.08	7.162	16.28	32.56
5	2.534	0.70	4.92	5.575	12.67	25.34
10	1.987	0.52	4.78	4.372	9.936	19.87
15	1.570	0.34	4.64	3.454	7.849	15.70
20	1.249	0.17	4.50	2.747	6.244	12.49
25	1.000	0.00	4.37	2.200	5.000	10.00
30	0.8059	0.16	4.25	1.773	4.030	8.059
35	0.6535	0.32	4.13	1.438	3.267	6.535
40	0.5330	0.47	4.02	1.173	2.665	5.330
45	0.4372	0.62	3.91	0.9618	2.186	4.372
50	0.3605	0.77	3.80	0.7932	1.803	3.606
55	0.2989	0.91	3.70	0.6575	1.494	2.989
60	0.2490	1.05	3.60	0.5478	1.245	2.490
65	0.2084	1.18	3.51	0.4586	1.042	2.084
70	0.1753	1.31	3.42	0.3857	0.8765	1.753
75	0.1481	1.44	3.33	0.3258	0.7405	1.481
80	0.1256	1.57	3.25	0.2764	0.6282	1.256
85	0.1070	1.69	3.16	0.2355	0.5352	1.070

**NTC thermistors,  
special long lead sensors**

**2322 641 2/3/4....**

**Table 3** Resistance values at intermediate temperatures

$T_{amb}$ (°C)	$R_T/R_{25}$	$\Delta R$ DUE TO B-TOLERANCE (%)	TC (%/K)	$R_{25}$ (kΩ)
				2322 641 2/3/4 ....; see Table 4, note 1
				.6473
-40	33.81	5.55	6.55	1589
-35	24.50	5.02	6.34	1151
-30	17.93	4.52	6.15	842.8
-25	13.25	4.03	5.96	622.6
-20	9.875	3.56	5.78	464.1
-15	7.425	3.10	5.61	349.0
-10	5.630	2.67	5.45	264.6
-5	4.304	2.24	5.29	202.3
0	3.315	1.84	5.14	155.8
5	2.573	1.44	4.99	120.9
10	2.011	1.07	4.85	94.53
15	1.583	0.70	4.72	74.40
20	1.254	0.34	4.59	58.95
25	1.000	0.00	4.46	47.00
30	0.8024	0.33	4.34	37.71
35	0.6474	0.66	4.23	30.43
40	0.5255	0.98	4.12	24.70
45	0.4288	1.28	4.01	20.15
50	0.3518	1.59	3.91	16.53
55	0.2901	1.88	3.81	13.63
60	0.2403	2.17	3.71	11.30
65	0.2001	2.45	3.62	9.404
70	0.1674	2.72	3.53	7.865
75	0.1406	2.99	3.44	6.607
80	0.1186	3.25	3.36	5.573
85	0.1004	3.51	3.28	4.721

**NTC thermistors,  
special long lead sensors**
**2322 641 2/3/4....**
**Table 4** Resistance values at intermediate temperatures

T <sub>amb</sub> (°C)	R <sub>T</sub> /R <sub>25</sub>	ΔR DUE TO B-TOLERANCE (%)	TC (%/K)	R <sub>25</sub> (kΩ)
				2322 641 2/3/4 ....; see note 1
				.6104
-40	36.66	5.69	6.70	3666
-35	26.38	5.15	6.49	2638
-30	19.17	4.63	6.29	1917
-25	14.06	4.13	6.10	1406
-20	10.41	3.65	5.92	1041
-15	7.779	3.18	5.74	777.9
-10	5.861	2.73	5.57	586.1
-5	4.453	2.30	5.41	445.3
0	3.409	1.88	5.26	340.9
5	2.631	1.48	5.11	263.1
10	2.044	1.09	4.97	204.4
15	1.600	0.72	4.83	160.0
20	1.261	0.35	4.70	126.1
25	1.000	0.00	4.57	100.0
30	0.7981	0.34	4.45	79.81
35	0.6408	0.67	4.35	64.08
40	0.5175	1.00	4.22	51.74
45	0.4202	1.32	4.11	42.02
50	0.3431	1.63	4.00	34.31
55	0.2816	1.93	3.90	28.16
60	0.2322	2.22	3.80	23.22
65	0.1925	2.51	3.71	19.25
70	0.1602	2.79	3.62	16.03
75	0.1340	3.06	3.53	13.40
80	0.1126	3.33	3.45	11.26
85	0.09496	3.59	3.36	9.496

**Note to Tables 2, 3 and 4**

1. Replace dot in last 5 digits of catalogue number by a number according to the following details: 2 for epoxy-coated type; 3 for water-resistant type and 4 for brass-pipe type.

NTC thermistors,  
special long lead sensors

2322 641 2/3/4....

## TESTS AND REQUIREMENTS

**Table 5** Stability tests

IEC	CECC	TEST	PROCEDURE	DRIFT REQUIREMENT
	D3; 4.20.1	endurance	85 °C; 1000 hours	ΔR/R < 5%
68-2-1		endurance	-40 °C; 1000 hours	ΔR/R < 5%
539		endurance	250 mW; 55 °C; 1000 hours	ΔR/R < 5%
68-2-3	D1; 4.19	damp heat, steady state	56 days at 40 °C; 90 to 95% RH	ΔR/R < 7%
68-2-14	C2; 4.14	rapid change of temperature	-40 to +85 °C; 50 cycles	ΔR/R < 5%

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special long lead sensors

2322 641 2/3/4....

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**NOTES**

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special long lead sensors

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2322 641 2/3/4....

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**NOTES**

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