# THERMISTORS (THERMALLY SENSITIVE RESISTORS), NTC, 4000 OHMS AT +25°C WITH A TEMPERATURE RANGE OF -55°C TO +115°C

## BASED ON TYPE 4K3A356

## ESCC Detail Specification No. 4006/002


| | |
|---|---|
| Issue 4 | December 2013 |


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## DOCUMENTATION CHANGE NOTICE

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| DCR No. | CHANGE DESCRIPTION |
|---|---|
| 716 | Specification upissued to convert Issue 3 (not Issue 2 as mentioned in the DCR - “interim” DCR No. 782 refers) of this specification to ESCC format and therefore accompany converted Generic Specification No. 4006 (updated in accordance with DCR 696). |

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# 1 GENERAL

## 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

## 1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

(a) ESCC Generic Specification No. 4006, Thermistors (Thermally Sensitive Resistors).
(b) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

## 1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply. In addition, the following symbols are used:

NTC = Negative Temperature Coefficient.
$R_Z$ = Zero Power Resistance.

## 1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

### 1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:

Example: 400600201

- Detail Specification Reference: 4006002
- Component Type Variant Number: 01

### 1.4.2 Component Type Variants and Range of Components

The component type variants and range of components applicable to this specification are as follows:

| Variant No. | Based on Type | | Resistance/Temperature Characteristics (Notes 1, 2) | | | | | | | | | Weight max (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | -55°C | -40°C | -25°C | 0°C | +25°C | +50°C | +70°C | +100°C | +115°C | |
| 01 | 4K3A356 | $R_Z$ (Ω) | 408340 | 140400 | 53740 | 13240 | 4000 | 1428.4 | 688.5 | 263.20 | 172.00 | 0.1 |
| | | Tol. (± %) | 3.3 | 2.5 | 2 | 1 | 0.84 | 0.74 | 0.65 | 0.57 | 1.5 | |

**NOTES:**

1. For test purposes, when zero power is dissipated and the ambient temperature is held as specified, the value is referred to as $R_Z$ (Zero Power Resistance).
2. The reference resistance is specified at +25°C.

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

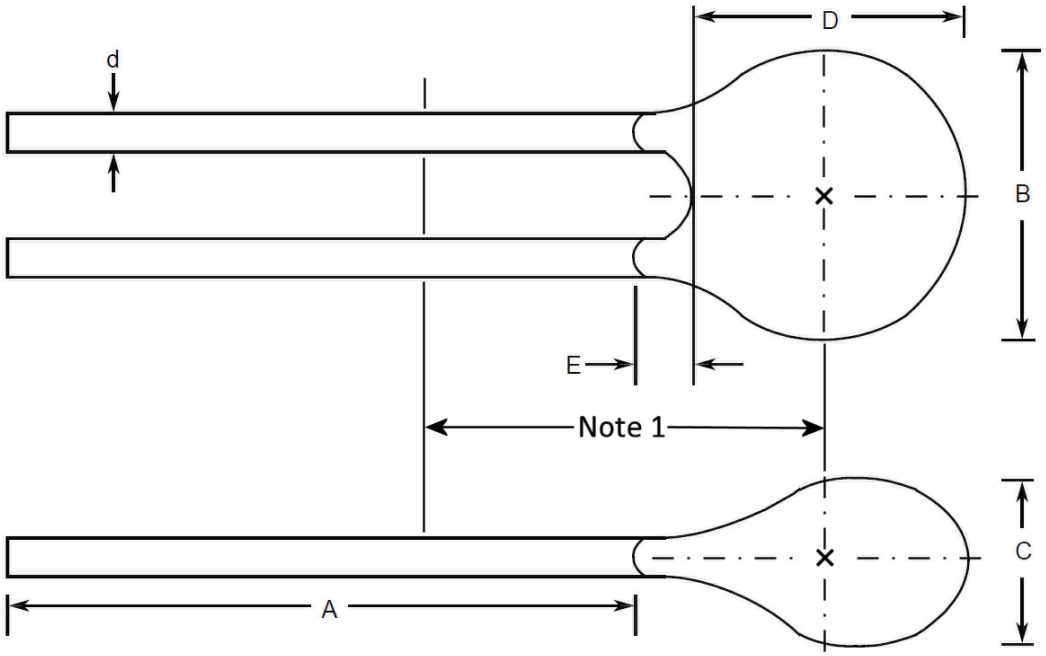
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

| Characteristics | Symbols | Maximum Ratings | Units | Remarks |
|---|---|---|---|---|
| Power Dissipation | $P_D$ | 2 | mW | Note 1 |
| Operating Temperature Range | $T_{op}$ | Note 2 | ºC | - |
| Storage Temperature Range | $T_{stg}$ | Note 3 | ºC | - |
| Soldering Temperature | $T_{sol}$ | +245 | ºC | Note 4 |

**NOTES:**

1. Never to be exceeded in the temperature measurement mode. The thermistors specified herein shall not be used in the self-heat mode.
2. See Component Type Variants and Range of Components.
3. -55°C to the Maximum Operating Temperature in Component Type Variants and Range of Components.
4. Duration 10 seconds maximum at a distance of not less than 10mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

1.6 PHYSICAL DIMENSIONS

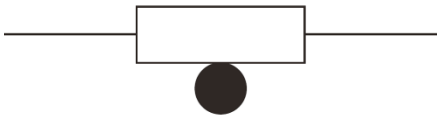


| Symbols | Dimensions mm | |
|---|---|---|
| | Min. | Max. |
| A | 50.8 | - |
| B | - | 2.29 |
| C | - | 2.29 |
| D | - | 3.5 |
| d | 0.23 | 0.28 |
| E | - | 1.6 |

**NOTES:**

1. The leads shall not be bent, or the means of fastening them cause bending in any direction within a distance of 15mm from the centre of the thermistor.

1.7 FUNCTIONAL DIAGRAM



1.8 MATERIALS AND FINISHES

1.8.1 Body

The thermistor shall be covered with an epoxy encapsulant.

1.8.2 Lead Material and Finish

The lead material shall be Type A with Type 3 finish in accordance with the requirements of ESCC Basic Specification No. 23500.

## 2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

*2.1.1.1 Deviations from Qualification and Periodic Tests - Chart F4*

(a) Dissipation Constant: Not Applicable.
(b) Short Time Load: Not Applicable.
(c) High Temperature Storage: Not Applicable.
(d) Permanence of Marking: Not Applicable.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and as follows.

The information to be marked on the component shall be:

(a) The ESCC Qualified Component Symbol (for ESCC qualified components only).
(b) The ESCC Component Number.
(c) Traceability information.

2.3 THERMAL SHOCK

Thermal Shock shall be performed as specified in the ESCC Generic Specification. The Test Condition shall be C, however the maximum test temperature shall be the applicable maximum operating temperature specified in Component Type Variants and Range of Components.

2.4 TERMINAL STRENGTH

The test conditions for Terminal Strength, tested as specified in the ESCC Generic Specification, shall be as follows:

Applied Force: 4.45 (+1.1 -0)N.
Duration: 5 seconds.

2.5 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures.

2.5.1 Room Temperature Electrical Measurements

Unless otherwise specified, the measurements shall be performed at $T_{amb}$ = +25 ±0.01°C.

| Characteristics | Symbols | Test Method and Conditions | Limits | | Units |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Zero Power Resistance | $R_Z$ | ESCC No. 4006 | Note 1 | | Ω |
| Insulation Resistance | $R_I$ | ESCC No. 4006<br>$T_{amb}$=+25±1°C<br>Note 2 | 100 | - | MΩ |
| Thermal Time Constant | KH | ESCC No. 4006<br>$T_{amb}$=+25±1°C<br>In Still Air<br>Note 3 | - | 25 | s |

**NOTES**

1. See Component Type Variants and Range of Components for resistance values and tolerances.
2. The measurements shall be performed on a sample of 5 components with 0 failures permitted. In the event of any failure a 100% inspection may be performed.
3. Test to be performed on 10 samples and only during Production Control Tests.

2.5.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed at each applicable temperature (with a tolerance of ±0.01°C) specified in Component Type Variants and Range of Components.

| Characteristics | Symbols | Test Method and Conditions | Limits | | Units |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Zero Power Resistance | $R_Z$ | ESCC No. 4006 | Note 1 | | Ω |

**NOTES**

1. See Component Type Variants and Range of Components for resistance values and tolerances.

2.6 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at $T_{amb}$ = +25 ±0.01°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

| Characteristics | Symbols | Limits | | | Units |
|---|---|---|---|---|---|
| | | Drift Value (Δ) | Absolute | | |
| | | | Min | Max | |
| Zero Power Resistance | $R_Z$ | ±0.2% | Note 1 | | Ω |

**NOTES**

1. See Component Type Variants and Range of Components for resistance values and tolerances.

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at $T_{amb}$ = +25 ±0.01°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

| Test Reference per ESCC No. 4006 | Characteristics | Symbols | Limits | | Units |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Thermal Time Constant | Initial Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| | Final Measurements<br>Thermal Time Constant | KH | - | 25 | s |
| Shock (Specified Pulse) | Initial Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| | After Shock<br>Zero Power Resistance Change | $\Delta R_Z/R_Z$ | ±2 | | % |
| Vibration | Initial Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| | After Vibration<br>Zero Power Resistance Change | $\Delta R_Z/R_Z$ | ±2 | | % |
| Resistance to Soldering Heat | Final Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| Moisture Resistance | Initial Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| | Final Measurements<br>Zero Power Resistance Change | $\Delta R_Z/R_Z$ | ±2 | | % |
| | Insulation Resistance | $R_I$ | 100 | - | MΩ |
| Terminal Strength | Initial Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| | Final Measurements<br>Zero Power Resistance Change | $\Delta R_Z/R_Z$ | ±2 | | % |

| Test Reference per ESCC No. 4006 | Characteristics | Symbols | Limits | | Units |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Operating Life | Initial Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| | At 1000 ±48 hours<br>Zero Power Resistance Change | $\Delta R_Z/R_Z$ | ±0.5 | | % |
| | Insulation Resistance | $R_I$ | 100 | - | MΩ |
| | At 2000 ±48 hours<br>Zero Power Resistance Change | $\Delta R_Z/R_Z$ | ±0.5 | | % |
| | Insulation Resistance | $R_I$ | 100 | - | MΩ |
| Low Temperature Storage | Initial Measurements<br>Zero Power Resistance | $R_Z$ | Note 1 | | Ω |
| | Final Measurements<br>Zero Power Resistance Change | $\Delta R_Z/R_Z$ | ±2 | | % |

**NOTES**

1. See Component Type Variants and Range of Components for resistance values and tolerances.

2.8 BURN-IN CONDITIONS

| Characteristics | Symbols | Test Conditions | Units |
|---|---|---|---|
| Ambient Temperature | $T_{amb}$ | Note 1 | °C |
| Power Dissipation | $P_D$ | 2 | mW |

**NOTES**

1. Maximum Operating Temperature specified in Component Type Variants and Range of Components (+0 -3) °C.

2.9 OPERATING LIFE CONDITIONS

The conditions shall be as specified for Burn-in.

## APPENDIX 'A'

AGREED DEVIATIONS FOR MEAS IRELAND (BETATHERM) LTD.

| Items Affected | Description of Deviations |
|---|---|
| Deviations from the Generic Specification | Deviation from Production Control - Chart F2<br>Room Temperature Electrical Measurements: Insulation Resistance may be measured in accordance with MEAS Ireland (Betatherm) Ltd Specification Ref. MFG 12-49-00.<br><br>Deviations from Screening Tests - Chart F3<br>Burn-in: Burn-in shall be performed without application of power, therefore the Power Dissipation ($P_D$) condition shall be 0W.<br><br>Room Temperature Electrical Measurements: Insulation Resistance may be measured in accordance with MEAS Ireland (Betatherm) Ltd Specification Ref. MFG 12-49-00.<br><br>Additional Deviation from Qualification and Periodic Tests - Chart F4<br>Room Temperature Electrical Measurements: Insulation Resistance may be measured in accordance with MEAS Ireland (Betatherm) Ltd Specification Ref. MFG 12-49-00. |