



Pages 1 to 15

**CHOKES, COMMON MODE, FIXED, MOULDED, SMD, BASED
ON SERIES CMC15, 18 AND 22**

ESCC Detail Specification No. 3201/010

| | |
|---------|---------------|
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1. **GENERAL**

1.1 **SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for Chokes, Common Mode, Fixed, Moulded, SMD, based on Series CMC15, 18 and 22. It shall be read in conjunction with ESCC Generic Specification No. 3201, the requirements of which are supplemented herein.

1.2 **COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS**

Variants and range of components covered by this specification are given in Table 1(a).

1.3 **MAXIMUM RATINGS**

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the chokes specified herein, are scheduled in Table 1(b).

1.4 **PARAMETER DERATING INFORMATION**

Not applicable.

1.5 **PHYSICAL DIMENSIONS**

The physical dimensions of the chokes specified herein are shown in Figure 2.

1.6 **FUNCTIONAL DIAGRAM**

The functional diagram for the chokes specified herein, is shown in Figure 3.

2. **APPLICABLE DOCUMENTS**

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

- (a) ESCC Generic Specification No. 3201 for RF Coils, Fixed.

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.

TABLE 1(a) - TYPE VARIANTS AND RANGE OF COMPONENTS

| Variant | Type Number | Nominal Inductance Each Winding L (μ H) | Inductance Measurement Voltage Test Condition V_T (mV) | Minimum Inductance Each Winding L (μ H) | Maximum DC Resistance Each Winding R_{DC} ($m\Omega$) | Rated RMS Current Each Winding I_R (Arms) | Lead/Terminal Finish Type Note 1 | Maximum Weight (g) |
|---------|-------------|--|--|--|---|---|----------------------------------|--------------------|
| 01 | CMC15 52K | 52 | 10 | 31 | 15 | 5.2 | 3 or 4 | 5 |
| | CMC15 M11 | 110 | 10 | 66 | 35 | 3.4 | 3 or 4 | 5 |
| | CMC15 M22 | 220 | 10 | 134 | 65 | 2.5 | 3 or 4 | 5 |
| | CMC15 M47 | 470 | 10 | 279 | 150 | 1.7 | 3 or 4 | 5 |
| | CMC15 1M0 | 1000 | 20 | 597 | 350 | 1.1 | 3 or 4 | 5 |
| | CMC15 2M0 | 2000 | 25 | 1210 | 770 | 0.7 | 3 or 4 | 5 |
| | CMC15 4M0 | 4000 | 35 | 2430 | 1750 | 0.5 | 3 or 4 | 5 |
| 02 | CMC15 52K | 52 | 10 | 31 | 15 | 5.2 | 11 or 15 | 5 |
| | CMC15 M11 | 110 | 10 | 66 | 35 | 3.4 | 11 or 15 | 5 |
| | CMC15 M22 | 220 | 10 | 134 | 65 | 2.5 | 11 or 15 | 5 |
| | CMC15 M47 | 470 | 10 | 279 | 150 | 1.7 | 11 or 15 | 5 |
| | CMC15 1M0 | 1000 | 20 | 597 | 350 | 1.1 | 11 or 15 | 5 |
| | CMC15 2M0 | 2000 | 25 | 1210 | 770 | 0.7 | 11 or 15 | 5 |
| | CMC15 4M0 | 4000 | 35 | 2430 | 1750 | 0.5 | 11 or 15 | 5 |
| 03 | CMC18 60K | 60 | 10 | 36 | 7 | 7.7 | 3 or 4 | 10 |
| | CMC18 M13 | 130 | 10 | 75 | 15 | 5.3 | 3 or 4 | 10 |
| | CMC18 M27 | 270 | 20 | 160 | 35 | 3.5 | 3 or 4 | 10 |
| | CMC18 M54 | 540 | 25 | 324 | 75 | 2.3 | 3 or 4 | 10 |
| | CMC18 1M1 | 1100 | 35 | 675 | 175 | 1.5 | 3 or 4 | 10 |
| | CMC18 2M4 | 2400 | 50 | 1440 | 415 | 1 | 3 or 4 | 10 |
| | CMC18 4M9 | 4900 | 70 | 2910 | 920 | 0.7 | 3 or 4 | 10 |
| 04 | CMC18 60K | 60 | 10 | 36 | 7 | 7.7 | 11 or 15 | 10 |
| | CMC18 M13 | 130 | 10 | 75 | 15 | 5.3 | 11 or 15 | 10 |
| | CMC18 M27 | 270 | 20 | 160 | 35 | 3.5 | 11 or 15 | 10 |
| | CMC18 M54 | 540 | 25 | 324 | 75 | 2.3 | 11 or 15 | 10 |
| | CMC18 1M1 | 1100 | 35 | 675 | 175 | 1.5 | 11 or 15 | 10 |
| | CMC18 2M4 | 2400 | 50 | 1440 | 415 | 1 | 11 or 15 | 10 |
| | CMC18 4M9 | 4900 | 70 | 2910 | 920 | 0.7 | 11 or 15 | 10 |
| 05 | CMC22 58K | 60 | 10 | 35 | 5 | 11 | 3 or 4 | 26 |
| | CMC22 M14 | 140 | 20 | 86 | 10 | 7.3 | 3 or 4 | 26 |
| | CMC22 M34 | 340 | 30 | 205 | 20 | 4.5 | 3 or 4 | 26 |
| | CMC22 M74 | 740 | 45 | 443 | 40 | 3.3 | 3 or 4 | 26 |
| | CMC22 1M6 | 1600 | 65 | 970 | 95 | 2.1 | 3 or 4 | 26 |
| | CMC22 3M3 | 3300 | 90 | 1990 | 205 | 1.4 | 3 or 4 | 26 |

| Variant | Type Number | Nominal Inductance Each Winding L (μH) | Inductance Measurement Voltage Test Condition V_T (mV) | Minimum Inductance Each Winding L (μH) | Maximum DC Resistance Each Winding R_{DC} ($m\Omega$) | Rated RMS Current Each Winding I_R (Arms) | Lead/Terminal Finish Type Note 1 | Maximum Weight (g) |
|---------|-------------|---|--|---|---|---|----------------------------------|--------------------|
| 06 | CMC22 58K | 60 | 10 | 35 | 5 | 11 | 11 or 15 | 26 |
| | CMC22 M14 | 140 | 20 | 86 | 10 | 7.3 | 11 or 15 | 26 |
| | CMC22 M34 | 340 | 30 | 205 | 20 | 4.5 | 11 or 15 | 26 |
| | CMC22 M74 | 740 | 45 | 443 | 40 | 3.3 | 11 or 15 | 26 |
| | CMC22 1M6 | 1600 | 65 | 970 | 95 | 2.1 | 11 or 15 | 26 |
| | CMC22 3M3 | 3300 | 90 | 1990 | 205 | 1.4 | 11 or 15 | 26 |

NOTES:

1. The lead/terminal finish shall be in accordance with the requirements of ESCC Basic Specification No. 23500.

TABLE 1(b) - MAXIMUM RATINGS

| No. | Characteristics | Symbol | Maximum Ratings | Unit | Remarks |
|-----|--|-----------|-----------------|--------------------|---|
| 1 | Rated Current | I_R | See Table 1(a) | Arms | Over the entire operating temperature range |
| 2 | Dielectric Withstanding Voltage (Note 1) | DWV | 500 | Vrms | |
| 3 | Operating Temperature Range | T_{op} | -55 to +125 | $^{\circ}\text{C}$ | T_{amb} |
| 4 | Storage Temperature Range | T_{stg} | -55 to +175 | $^{\circ}\text{C}$ | |
| 5 | Soldering Temperature | T_{sol} | +260 | $^{\circ}\text{C}$ | Note 2 |

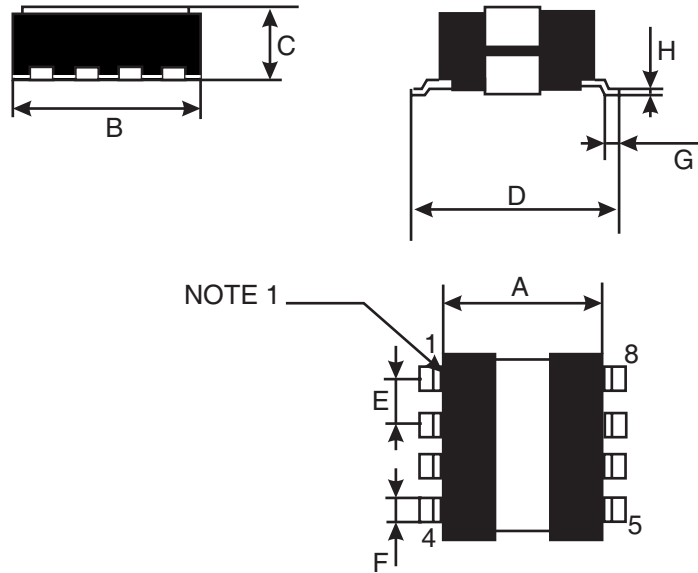
NOTES:

1. This rating applies both between separate windings and between the windings and the case.
2. Duration 5 seconds maximum, the same terminal shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

Figure 2 - PHYSICAL DIMENSIONS

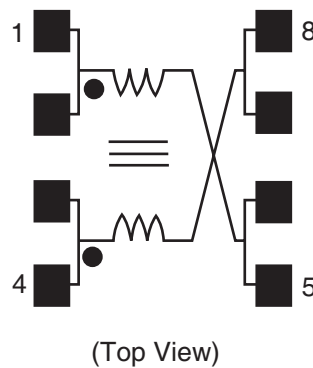


| Dimensions (mm) | | | | | | |
|-----------------|-----------------|------|-----------------|------|-----------------|------|
| Symbol | Variants 01, 02 | | Variants 03, 04 | | Variants 05, 06 | |
| | Min | Max | Min | Max | Min | Max |
| A | 16 | 16.5 | 21.7 | 22.3 | 30.4 | 30.9 |
| B | - | 16 | - | 19.8 | - | 23.5 |
| C | - | 8 | - | 8.9 | - | 12.5 |
| D | 21.1 | 22 | 25.5 | 26.4 | 36.1 | 37 |
| E | 3.7 | 3.9 | 3.7 | 3.9 | 2.45 | 2.65 |
| F | 1 | 1.2 | 1.9 | 2.1 | 1.9 | 2.1 |
| G | 1.3 | 1.6 | 1.3 | 1.6 | 1.3 | 1.6 |
| H | 0.2 | 0.4 | 0.2 | 0.4 | 0.2 | 0.4 |

NOTES:

1. Pin 1 shall be identified with a contrasting coloured identification mark or indent in the area shown.

FIGURE 3 - FUNCTIONAL DIAGRAM



4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the components specified herein are stated in this specification and ESCC Generic Specification No. 3201 for RF Coils, Fixed. Deviations from the Generic Specification, applicable to this specification only, are detailed in Para. 4.2.

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 requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-Process Controls

None

4.2.2 Deviations from Final Production Tests (Chart II)

None.

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

- (a) Para. 9.3.2, Parameter Drift Value, Final Measurements: Shall be performed after a recovery period of 24 ± 2 hours post Burn-In.
- (b) Para. 9.4, Radiographic Inspection: Shall not be performed.

4.2.4 Deviations from Qualification Tests (Chart IV)

- (a) Para. 9.17, Immersion: Shall not be performed.
- (b) Para. 9.18, Moisture Resistance: There shall be no polarisation voltage during test.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

- (a) Para. 9.18, Moisture Resistance: There shall be no polarisation voltage during test.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the chokes specified herein shall be verified in accordance with the requirements set out in Para. 9.6 of ESCC Generic Specification No. 3201 and shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the chokes specified herein shall be as given in Type Variants and Range of Components.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Para. 9.12 of ESCC Generic Specification No. 3201.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the connectors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

As a minimum, a resin moulding shall ensure the chokes protection.

4.4.2 Terminal Material and Finish

The terminal material shall be brass with 2 to 3 μm of Nickel underplating. The terminal finish shall be as specified in Type Variants and Range of Components.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:

- (a) The ESCC Component Number.
- (b) Electrical Characteristics and Ratings.
- (c) Traceability Information.

4.5.2 The ESCC Component Number

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

320101001B

- Detail Specification Number: 3201010
- Type Variant Number (see Table 1(a)): 01
- Testing Level (B or C, as applicable): B

4.5.3 Electrical Characteristics and Ratings

The electrical characteristics and ratings to be marked in the following order of precedence are:-

- (a) Numerical Value.

The information shall be constituted and marked as follows:-

52K

- Numerical value: 52μH

4.5.3.1 *Inductance Values*

The numerical values for inductance shall be expressed by means of the following codes. The unit quantity for marking shall be in microhenries.

| Numerical Value | Code |
|-----------------|------|
| XX | XXK |
| XXX | MXX |
| XXXX | XXM |

The inductance values available for each Type Variant are specified in Type Variants and Range of Components.

4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at Room Temperature are scheduled in Table 2. Unless otherwise specified, measurements shall be performed at $T_{amb}=22\pm3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at High and Low Temperatures are scheduled in Table 3. Unless otherwise specified, measurements shall be performed at $T_{amb}=+125(+0-5)$ and $-55(+5-0)$ °C respectively.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb}=+22\pm3$ °C.

The parameter drift values (Δ) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of the ESCC Generic Specification No. 3201. The conditions for burn-in shall be as specified in Table 5(a) of this specification.

4.7.3 Electrical Circuit for Burn-in (Figure 5(a))
 Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

| No. | Characteristics | Symbol | ESCC 3201 Test Method | Test Condition | Limits | | Unit |
|-----|---|-----------------|-----------------------|--|--------|--------|------|
| | | | | | Min | Max | |
| 01 | Inductance | L | Para. 9.3.1.1 | Magnetic Field < 10mT f=10kHz V _T =Note 1 | Note 2 | - | μH |
| 02 | DC Resistance | R _{DC} | Para. 9.3.1.4 | Para. 9.3.1.4 | - | Note 3 | mΩ |
| 03 | Dielectric With-standing Voltage Leakage Current (Note 4) | I _L | Para. 9.3.1.5 | 500 Vrms | - | 100 | μA |

NOTES:

1. The test voltage conditions shall be as specified in Table 1(a).
2. The limits for Inductance for each winding are as specified in Table 1(a).
3. The limits for DC Resistance for each winding are as specified in Table 1(a).
4. Tested both between the windings and between the windings and the case.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (NOTE 1)

| No. | Characteristics | Symbol | ESCC 3201 Test Method | Test Condition | Limits | | Unit |
|-----|---------------------|---------------|-----------------------|----------------|--------|------|------|
| | | | | | Min | Max | |
| 01 | Inductance (Note 2) | ΔL/L (Note 3) | As per Table 2 | As per Table 2 | -50 | +100 | % |

NOTES:

1. To be performed on 5 components. In the event of any failure a 100% inspection shall be performed.
2. For each winding.
3. ΔL/L is calculated from the difference between the high or low temperature inductance value and the room temperature inductance value divided by the room temperature inductance value.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

| No. | Characteristics | Symbol | Spec and/or Test Method | Test Condition | Change Limits (Δ) | Unit |
|-----|---------------------|--------|-------------------------|----------------|-------------------|------|
| 01 | Inductance (Note 1) | ΔL/L | As per Table 2 | As per Table 2 | ±10 | % |

NOTES:

1. For each winding.

TABLE 5(a) - CONDITIONS FOR BURN-IN

| No. | Characteristics | Symbol | Conditions | Unit |
|-----|---------------------|------------------|-------------|------|
| 01 | Ambient Temperature | T _{amb} | +125(+0 -3) | °C |

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TEST

| No. | Characteristics | Symbol | Conditions | Unit |
|-----|---------------------|------------------|---|------|
| 01 | Ambient Temperature | T _{amb} | +125(+0 -3) | °C |
| 02 | Loading and Cycling | - | Para. 9.19 of ESCC 3201 Rated RMS Current shall be applied to both windings in series (Note 1) | - |

NOTES:

1. The Rated RMS Current for each winding as specified in Table 1(a).

FIGURE 5(a) - ELECTRICAL CIRCUIT FOR BURN-IN

Not applicable.

FIGURE 5(b) - ELECTRICAL CIRCUIT FOR OPERATING LIFE TEST

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTING (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO. 3201)

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured and inspections to be performed on completion of environmental testing are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at T_{amb}=+22 ±3°C.

4.8.2 Measurements and Inspections at Intermediate Points During Endurance Tests

The parameters to be measured and inspections to be performed during endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at T_{amb}=+22 ±3°C.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured and inspections to be performed on completion of endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at T_{amb}=+22 ±3°C.

4.8.4 Conditions for Operating Life Test (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 3201. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

4.8.5 Electrical Circuit for Operating Life Test (Figure 5(b))

Not applicable.

Table 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

| No. | ESCC Generic Spec. No. 3201 | | Measurements and Inspections | | Symbol | Limits | | Unit |
|-----|--|--|--|---|---------------------------------|----------------|--|--|
| | Environmental and Endurance Tests (Note 1) | Test Method and Conditions | Identification | Conditions | | Min | Max | |
| 01 | Thermal Shock | Para. 9.2 | Visual Examination | Evidence of damage or loosening of terminals | - | - | - | - |
| 02 | Solderability | Para. 9.7 | Visual Examination | MIL-STD 202 Method 208 Solid Wire Termination Criteria | - | - | - | - |
| 03 | Barometric Pressure | Para. 9.8 | During Test Dielectric Withstanding Voltage Leakage Current | While still at low pressure Table 2 Item 3 | I_L | Table 2 Item 3 | | μA |
| 04 | Temperature Rise | Para. 9.9 and Table 1(a) of this spec. at +90 °C | Temperature Rise | Within 30 seconds of removal of power Temperature Change | ΔT | - | 25 | °C |
| 05 | Overload | Para. 9.10 of this spec. | After Test Visual Examination Final Measurements DC Resistance Dielectric Withstanding Voltage Leakage Current | Evidence of cracked cases, charred windings, destroyed or softened insulation or loosening of terminals After 24 hours Table 2 Item 2 Table 2 Item 3 | - R_{DC} I_L | - | - Table 2 Item 2 Table 2 Item 3 | - $m\Omega$ μA |
| 06 | Resistance to Soldering Heat | Para. 9.11 | Final Measurements Inductance DC Resistance Dielectric Withstanding Voltage Leakage Current After Test Visual Examination | Table 2 Item 1 Table 2 Item 2 Table 2 Item 3 Evidence of damage or loosening of terminals | L R_{DC} I_L - | - | Table 2 Item 1 Table 2 Item 2 Table 2 Item 3 | μH $m\Omega$ μA - |
| 07 | Terminal Strength | Para. 9.12.2 | Visual Examination | Evidence of damage | - | - | - | - |
| 08 | Low Temperature Storage | Para. 9.14 and Table 1(b) of this spec. | Visual Examination | Evidence of damage or loosening of terminals | - | - | - | - |
| 09 | Vibration | Para. 9.15 | Visual Examination | Evidence of damage | - | - | - | - |
| 10 | Shock (Specified Pulse) | Para. 9.16 | Visual Examination | Evidence of damage | - | - | - | - |
| 11 | Immersion | Para. 9.17 | Not applicable | - | - | - | - | - |

| No. | ESCC Generic Spec. No. 3201 | | Measurements and Inspections | | Symbol | Limits | | Unit | |
|---------------|--|--|--|--|--------------|----------------|-----|-----------|--|
| | Environmental and Endurance Tests (Note 1) | Test Method and Conditions | Identification | Conditions | | Min | Max | | |
| 12 | Moisture Resistance | Para. 9.18 and Pars. 4.2.4 and 4.2.5 of this spec. Before Tests, Thermal Shock per MIL-STD-202 Method 107 Cond. A. | Final Measurements | Within 30 mins of removal from 1.5 to 3.5 hr. Conditioning | - | - | - | - | |
| | | | Dielectric Withstanding Voltage Leakage Current | Table 2 Item 3 | I_L | Table 2 Item 3 | | μA | |
| | | | Inductance | Table 2 Item 1 | L | Table 2 Item 1 | | μH | |
| | | | DC Resistance | Table 2 Item 2 | R_{DC} | Table 2 Item 2 | | $m\Omega$ | |
| | | | After Test | | | | | | |
| | | | Visual Examination | No evidence of corrosion | - | - | - | - | |
| 13 | Operating Life | Para. 9.19 | Initial Measurements | | | | | | |
| | | | Inductance | Table 2 Item 1 | $\Delta L/L$ | Table 2 Item 1 | | μH | |
| | | | Intermediate Measurements (when applicable) | At 1000 hours After a recovery period of 30 mins | - | - | - | - | |
| | | | Dielectric Withstanding Voltage Leakage Current | Table 2 Item 3 | I_L | Table 2 Item 3 | | μA | |
| | | | Inductance Change | Table 2 Item 1 | ΔL | -10 | +10 | % | |
| | | | Final Measurements | At 1000 hours or 2000 hours, as applicable, after a recovery period of 30 mins | | | | | |
| | | | Dielectric Withstanding Voltage Leakage Current | Table 2 Item 3 | I_L | Table 2 Item 3 | | μA | |
| | | | Inductance Change | Table 2 Item 1 | $\Delta L/L$ | -10 | +10 | % | |
| DC Resistance | Table 2 Item 2 | R_{DC} | Table 2 Item 2 | | $m\Omega$ | | | | |

NOTES:

- The tests in this table refer to either Chart IV or V and shall be used as applicable.