



## **TRANSFORMERS AND INDUCTORS, MOULDED, SMD**

### **BASED ON SERIES CCM**

### **ESCC Detail Specification No. 3201/011**

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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. [3201](#).

### 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 definition shall apply:

- Total Indicative Power: An indication of the maximum power that can be provided by a switched mode power supply that employs the particular transformer specified herein.

### 1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

#### 1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 320101101AB12345

- Detail Specification Reference: 3201011
- Component Type Variant Number: 01 (as required)
- Manufacturer Specific Component Identification: AB12345 (as applicable) where:
  - AB: First two letters of the applicable Manufacturer's name
  - 12345: A unique reference allocated by the Manufacturer to a specific component design.

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 Number	Type	Design Domain	Electrical Characteristics	Total Indicative Power (W)	No. of Terminals	Terminal Finish (3)	Weight Max (g)
01	CCM4	Note 1	Note 2	18	12	Sn60Pb40	5.1
02	CCM5	Note 1	Note 2	40	16	Sn60Pb40	7.4
03	CCM6	Note 1	Note 2	50	16	Sn60Pb40	12.1
04	CCM20	Note 1	Note 2	120	16	Sn60Pb40	21.4
05	CCM25	Note 1	Note 2	150	20	Sn60Pb40	44.2

**NOTES:**

1. The design domain for components produced in accordance with this specification includes the following items:
  - Development of customized electrical functions:
    - Single or multi-coupled inductors
    - Common mode chokes
    - Power transformers (flyback, forward, push-pull, half/full bridge, specific architectures)
    - Signal transformers
    - Pulse transformers
    - Current/voltage measurement transformers
    - Specific magnetic functions within environment and thermal requirements
  - Temperature ranges: as per Para. 1.5
  - Power, losses, and component heating:
    - Maximum power depends on component heating. The heating is calculated from losses and thermal resistances for each Variant according to the electrical function. The thermal resistances are given in Maximum Ratings
    - The maximum temperature rise at  $T_{amb} = +100^{\circ}\text{C}$  is  $+25^{\circ}\text{C}$ .
    - Examples of maximum power per Variant are given above.
  - Dielectric strength:
    - Single insulation: 500Vrms
    - Reinforced insulation: 1000Vrms
2. All electrical characteristics applicable to a particular component design shall be specified in the Specific Component Design Sheet; see Para. 1.4.3.
3. See Para. 1.8.2 for details.

### 1.4.3 Manufacturer Specific Component Identification

A Specific Component Design Sheet shall be produced by the Manufacturer after negotiation with the Orderer, and it shall be held under configuration control by the Manufacturer who will allocate a unique Manufacturer Specific Component Identification when a request for a component is received.

Each Specific Component Design Sheet shall detail the selected options applicable to the component design and include the following information as a minimum:

- (a) The Manufacturer Specific Component Identification.
- (b) The ESCC Detail Specification number and issue.
- (c) The applicable Variant number.
- (d) Details of the intended application (e.g. signal transformer; measurement transformer, pulse transformer, supply or converter transformer; inductor).
- (e) Functional diagram showing terminal identification and polarities.
- (f) All specific Maximum Ratings.
- (g) Room Temperature Electrical Measurements including applicable test conditions and limits.
- (h) High and Low Temperatures Electrical Measurements including applicable test conditions and limits.
- (i) Intermediate and End-Point Electrical Measurements including applicable test conditions and limits.
- (j) Operating Life load test conditions.
- (k) Details of any deviations or additions to the requirements of the ESCC Detail Specification.

**NOTE:**

In case of conflict with regards to documentation, the Specific Component Design Sheet shall take precedence.

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 (Note 1)	Symbols	Maximum Ratings	Units	Remarks
Thermal Resistance	$R_{th}$		$^{\circ}C/W$	
Variant 01:		58.38		At $T_{amb} = +25^{\circ}C$
Variant 02:		48.59		At $T_{amb} = +25^{\circ}C$
Variant 03:		33.84		At $T_{amb} = +25^{\circ}C$
Variant 04:		28.57		At $T_{amb} = +25^{\circ}C$
Variant 05:		24.18		At $T_{amb} = +25^{\circ}C$
Variant 01:		55.89		At $T_{amb} = +125^{\circ}C$
Variant 02:		46.11		At $T_{amb} = +125^{\circ}C$
Variant 03:		30.8		At $T_{amb} = +125^{\circ}C$
Variant 04:		27.39		At $T_{amb} = +125^{\circ}C$
Variant 05:		21		At $T_{amb} = +125^{\circ}C$
Operating Temperature Range	$T_{op}$	-55 to +125	$^{\circ}C$	$T_{amb}$
Storage Temperature Range	$T_{stg}$	-55 to +125	$^{\circ}C$	
Soldering Temperature	$T_{sol}$	+260	$^{\circ}C$	Note 2

**NOTES:**

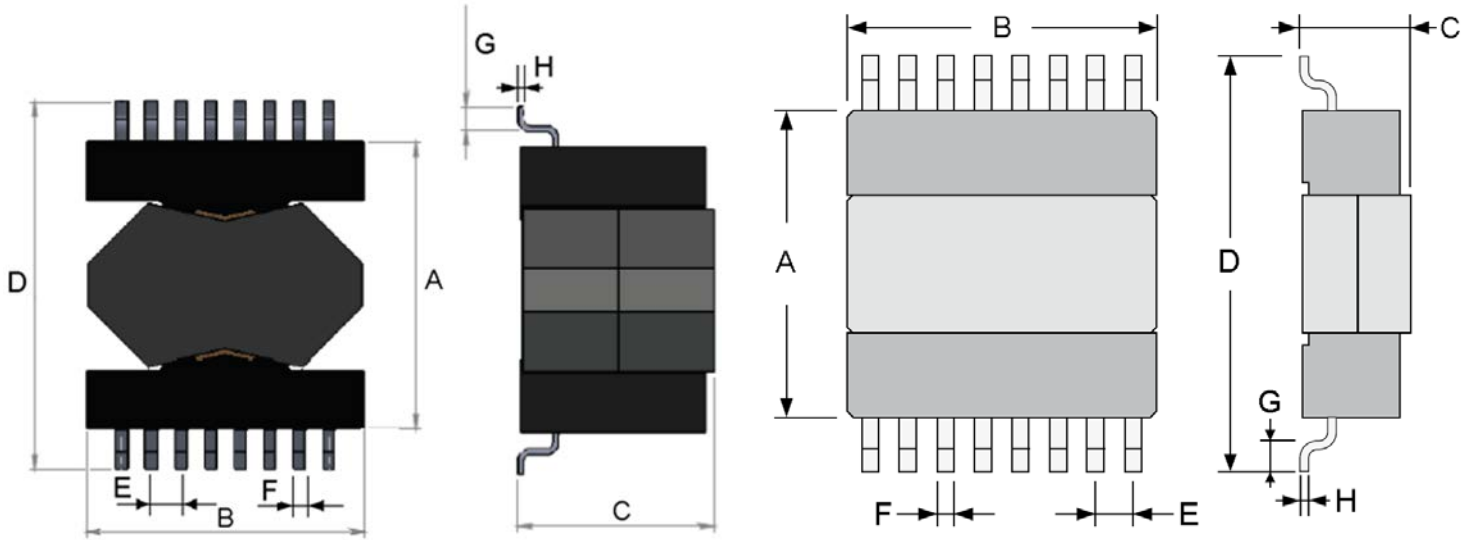
- Other ratings specific to a particular component design shall be specified in the Specific Component Design Sheet; see Para. 1.4.3.
- Duration 5 seconds maximum, the same terminal shall not be resoldered until 3 minutes have elapsed.



1.6 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

Example: Variant 03 shown (Type CCM6)

Example: Variant 04 shown (Type CCM20)



Symbols	Dimensions (mm)									
	Variant 01		Variant 02		Variant 03		Variant 04		Variant 05	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
A	-	16	-	17.5	-	19	-	23.8	-	30
B	-	13.5	-	17.2	-	18.5	-	21.4	-	26
C	-	11.1	-	11	-	13	-	13.4	-	17
D	20.7	21.3	22.5	23.1	24.2	24.8	28.5	29.1	35.5	36.1
E	1.905 BSC		1.905 BSC		1.905 BSC		2.286 BSC		2.286 BSC	
F	0.8	1	0.8	1	0.7	0.9	0.8	1	0.8	1
G	1.05	1.45	1.15	1.55	1.2	1.6	1.05	1.45	1.55	1.95
H	0.2	0.4	0.2	0.4	0.3	0.5	0.3	0.5	0.3	0.5
No. of Terminals	2 x 6		2 x 8		2 x 8		2 x 8		2 x 10	

**NOTES:**

1. Terminal identification: shall be specified in the Specific Component Design Sheet; see Para. 1.4.3.
2. The general physical design of Variants 01 and 02 are similar to Variant 03 as shown. The general physical design of Variant 05 is similar to Variant 04 as shown.

1.7 FUNCTIONAL DIAGRAM

The functional diagram showing terminal identification and polarities shall be specified in the in the Specific Component Design Sheet; see Para. 1.4.3.

## 1.8 MATERIALS AND FINISHES

### 1.8.1 Case

As a minimum, the case shall be coated with a suitable moulding resin.

### 1.8.2 Terminals

The terminal material shall be brass, plated with 3 to 5µm of copper. The finish shall be Sn60Pb40.

## 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) Barometric Pressure: shall not be performed.
- (b) Immersion: shall not be performed.
- (c) Moisture Resistance, Polarisation: there shall be no polarising voltage applied.
- (d) Operating Life, Operating conditions: No load shall be applied.

### 2.2 MARKING

The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. [21700](#). 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 each component in its primary package.

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

- (a) Terminal identification (see Para. 1.6).
- (b) The ESCC qualified components symbol (for ESCC qualified components only).
- (c) The ESCC Component Number (see Para. 1.4.1).
- (d) Traceability information.

2.3 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

2.3.1 Room Temperature Electrical Measurements

The measurements shall be performed at  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ .

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Primary Inductance	L	ESCC No. 3201 f = Note 1 I = 0Adc	Note 1	Note 1	
Loaded Inductance	L <sub>R</sub>	ESCC No. 3201 f = Note 1 I = I <sub>R</sub> (Note 1)	Note 1	Note 1	
DC Resistance	R <sub>DC</sub>	ESCC No. 3201	Note 1	Note 1	
Insulation Resistance	R <sub>I</sub>	ESCC No. 3201	Note 1	Note 1	
Dielectric Withstanding Voltage	DWV	ESCC No. 3201	500 or 1000 (Note 1)	-	Vrms
Dielectric Withstanding Voltage Leakage Current	I <sub>L</sub>	Note 2	Note 1	Note 1	
Turns Ratio and/or Voltage Ratio	T.R. V.R.	ESCC No. 3201	Note 1	Note 1	
Polarity	P	ESCC No. 3201	Note 1	Note 1	
Capacitance	C	ESCC No. 3201	Note 1	Note 1	
Quality Factor	Q	ESCC No. 3201	Note 1	Note 1	
Centre-tap Resistive and Inductive Unbalance	B	ESCC No. 3201	Note 1	Note 1	
Phase Shift	Φ	ESCC No. 3201	Note 1	Note 1	
Primary Impedance	Z <sub>P</sub>	ESCC No. 3201	Note 1	Note 1	
Frequency Response	F.R.	ESCC No. 3201	Note 1	Note 1	
Self-Resonant Frequency	f <sub>r</sub>	ESCC No. 3201	Note 1	Note 1	
Harmonic Distortion	H.D.	ESCC No. 3201	Note 1	Note 1	
Insertion Loss	I.L.	ESCC No. 3201	Note 1	Note 1	
Waveshape	W	ESCC No. 3201	Note 1	Note 1	

**NOTES:**

1. Test conditions and limits for each characteristic, as applicable, shall be specified in the Specific Component Design Sheet; see Para. 1.4.3.
2. Measured during Dielectric Withstanding Voltage.

2.3.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Notes 1, 2)	Limits		Unit
			Min	Max	
Primary Inductance	L	ESCC No. 3201 f = Note 2 I = 0Adc	Note 2	Note 2	

**NOTES:**

1. The measurements shall be performed on a sample of 5 components from each lot with 0 failures allowed. In the event of any failure a 100% inspection may be performed.
2. Test conditions and limits for each characteristic, as applicable, shall be specified in the Specific Component Design Sheet; see Para. 1.4.3.

2.4 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +22 \pm 3^{\circ}C$ .

Unless otherwise specified, the test methods and test conditions shall be as per the corresponding test defined in Para. 2.3.1 Room Temperature Electrical Measurements.

Test Reference per ESCC No. 3201	Characteristics (Note 1)	Symbols	Limits		Units
			Min	Max	
Thermal Shock	Inductance	L	Note 1		
	DC Resistance	$R_{DC}$	Note 1		
	Insulation Resistance	$R_I$	Note 1		
	Dielectric Withstanding Voltage	DWV	Note 1		
	DWV Leakage Current	$I_L$	Note 1		
Temperature Rise Initial Measurements	DC Resistance (at $0.1I_R$ )	$R_{DC}$	Record Value	$m\Omega$	
	Final Measurements (within 30s of the removal of power)	DC Resistance (at $I_R$ )	$R_{DC}$	Record Value	$m\Omega$
		Temperature Rise	$\Delta T$	Note 1	
Overload	DC Resistance	$R_{DC}$	Note 1		
	Insulation Resistance	$R_I$	Note 1		
	Dielectric Withstanding Voltage	DWV	Note 1		
	DWV Leakage Current	$I_L$	Note 1		
Resistance to Soldering Heat	Inductance	L	Note 1		
	DC Resistance	$R_{DC}$	Note 1		
	Dielectric Withstanding Voltage	DWV	Note 1		
	DWV Leakage Current	$I_L$	Note 1		

Test Reference per ESCC No. 3201	Characteristics (Note 1)	Symbols	Limits		Units	
			Min	Max		
Moisture Resistance  Within 30 min of removal from conditioning:  Within 1 hour of previous measurements:	Dielectric Withstanding Voltage	DWV	Note 1			
	DWV Leakage Current	I <sub>L</sub>	Note 1			
	Insulation Resistance	R <sub>I</sub>	Note 1			
	Inductance	L	Note 1			
	DC Resistance	R <sub>DC</sub>	Note 1			
Operating Life  Initial Measurements (0 hour)  Intermediate Measurements (1000 hours)(after 30 min recovery)  Final Measurements (2000 hours)(after 30 min recovery)	Inductance	L	Note 1			
	Dielectric Withstanding Voltage	DWV	Note 1			
	DWV Leakage Current	I <sub>L</sub>	Note 1			
	Inductance Change	ΔL/L	Note 1			
	Dielectric Withstanding Voltage	DWV	Note 1			
	DWV Leakage Current	I <sub>L</sub>	Note 1			
	Inductance Change	ΔL/L	Note 1			
	Loaded Inductance	L <sub>R</sub>	Note 1			
	DC Resistance	R <sub>DC</sub>	Note 1			
	Insulation Resistance	R <sub>I</sub>	Note 1			

**NOTES:**

1. Test conditions and limits for each characteristic, as applicable, shall be specified in the Specific Component Design Sheet; see Para. 1.4.3.

2.5 BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T <sub>amb</sub>	+125 (+0 -3)	°C

**NOTES:**

1. After Burn-in, the components shall be removed from the chamber and allowed to cool under normal atmospheric conditions for recovery for 24 hours minimum.

2.6 OPERATING LIFE CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T <sub>amb</sub>	+125 (+0 -3)	°C
Load	-	Note 1	-

**NOTES:**

1. Test condition, as applicable, shall be specified in the Specific Component Design Sheet; see Para. 1.4.3.