



**R.F. INDUCTORS, FIXED, MINIATURE, MOULDED, SMD**

**BASED ON SERIES MSC1 10K, 12K, 20K AND H01**

**ESCC Detail Specification No. 3201/008**

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DCR No.	CHANGE DESCRIPTION
1460	Specification upissued to incorporate changes per DCR.

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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.

### 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: 3201008014L7K

- Detail Specification Reference: 3201008
- Component Type Variant Number: 01 (as required)
- Characteristic code: Inductance Value (4.7 $\mu$ H): 4L7 (as required)
- Characteristic code: Inductance Tolerance ( $\pm$ 10%): K (as required)

##### 1.4.1.1 *Characteristics Codes*

Characteristics to be codified as part of the ESCC Component Number shall be as follows:

- (a) Inductance Value expressed by means of the following codes in accordance with ESCC Basic Specification No. [21700](#). The unit quantity shall be microhenries ( $\mu$ H):

Inductance Value L ( $\mu$ H)	Code
0.0XX	L0XX
0.XX	LXX
X.X	XLX
XX	XX0
XX 10 <sup>1</sup>	XX1
XX 10 <sup>2</sup>	XX2

- (b) Inductance Tolerance expressed by the following codes in accordance with ESCC Basic Specification No. 21700:

Tolerance ( $\pm$ %)	Code Letter
2	G
5	J
10	K
15	L

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	Case Size (1)	Terminal Finish (2)	Weight Max (g)
01	10K	A	Au	0.2
	12K	B	Au	0.2
02	10K	A	SnPb	0.2
	12K	B	SnPb	0.2
03	20K	C	Au	0.5
04	20K	C	SnPb	0.5
05	H01	C	SnPb	0.5

**RANGE OF COMPONENTS – VARIANTS 01, 02 (10K SERIES)**

Inductance	Tolerance	Q Min	L & Q Test Frequency	Self-Resonant Frequency Min	DC Resistance Max	Rated DC Current	Case Size (1)
L ( $\mu$ H)	$\pm$ %	Q	$f_t$ (MHz)	$f_r$ (MHz)	$R_{dc}$ ( $\Omega$ )	$I_R$ (mA)	
0.01	10	60	150	1000	0.025	750	A
0.012	10	60	150	1000	0.025	750	A
0.015	10	60	150	1000	0.025	750	A
0.018	10	60	150	1000	0.025	750	A
0.022	5, 10	51	100	1000	0.025	750	A
0.027	5, 10	51	100	1000	0.03	750	A
0.033	5, 10	47	100	1000	0.04	640	A
0.039	5, 10	47	100	1000	0.05	600	A
0.047	5, 10	47	100	1000	0.06	550	A
0.056	5, 10	47	100	900	0.065	520	A
0.068	5, 10	47	100	900	0.085	480	A
0.082	5, 10	47	100	750	0.115	470	A
0.1	10	47	50	620	0.07	470	A
0.12	10	47	50	540	0.07	470	A
0.15	10	47	50	450	0.075	450	A
0.18	10	51	50	400	0.095	430	A
0.22	10	51	50	380	0.155	350	A

Inductance	Tolerance	Q Min	L & Q Test Frequency	Self-Resonant Frequency Min	DC Resistance Max	Rated DC Current	Case Size (1)
L (μH)	± %	Q	f <sub>t</sub> (MHz)	f <sub>r</sub> (MHz)	R <sub>dc</sub> (Ω)	I <sub>R</sub> (mA)	
0.27	10	51	50	340	0.18	310	A
0.33	10	51	50	280	0.195	280	A
0.39	10	47	50	240	0.21	240	A
0.47	5, 10	47	25	210	0.225	230	A
0.56	5, 10	52	25	180	0.245	220	A
0.68	5, 10	52	25	160	0.265	210	A
0.82	5, 10	52	25	130	0.29	200	A
1	5, 10	52	25	110	0.34	190	A
1.2	2, 5, 10	42	7.9	110	0.55	180	A
1.5	2, 5, 10	42	7.9	100	0.73	160	A
1.8	2, 5, 10	48	7.9	95	0.92	150	A
2.2	2, 5, 10	48	7.9	90	1.1	140	A
2.7	2, 5, 10	48	7.9	65	1.25	130	A
3.3	2, 5, 10	48	7.9	55	1.7	120	A
3.9	2, 5, 10	48	7.9	45	2	110	A
4.7	2, 5, 10	48	7.9	43	2.3	100	A
5.6	2, 5, 10	48	7.9	40	2.5	100	A
6.8	2, 5, 10	46	7.9	38	2.6	98	A
8.2	2, 5, 10	46	7.9	35	2.8	95	A
10	2, 5, 10	46	7.9	33	2.8	87	A

**RANGE OF COMPONENTS – VARIANTS 01, 02 (12K SERIES)**

Inductance	Tolerance	Q Min	Test Frequency	Self-Resonant Frequency Min	DC Resistance Max	Rated DC Current	Case Size (1)
L (μH)	± %	Q	f <sub>t</sub> (MHz)	f <sub>r</sub> (MHz)	R <sub>dc</sub> (Ω)	I <sub>R</sub> (mA)	
12	2, 5, 10	42	2.5	26	2	110	B
15	2, 5, 10	44	2.5	24	2.2	105	B
18	2, 5, 10	44	2.5	21	2.8	100	B
22	2, 5, 10	48	2.5	20	3.5	85	B
27	2, 5, 10	49	2.5	19	4.3	75	B
33	2, 5, 10	50	2.5	14	5.5	68	B
39	2, 5, 10	52	2.5	12	6.5	61	B
47	2, 5, 10	53	2.5	11	8.5	54	B
56	2, 5, 10	56	2.5	10	12	46	B
68	2, 5, 10	53	2.5	9	13	42	B
82	2, 5, 10	49	2.5	8	15	40	B
100	2, 5, 10	49	2.5	7	18	36	B
120	2, 5, 10	37	0.79	6	21	34	B
150	2, 5, 10	30	0.79	5	26	31	B

Inductance	Tolerance	Q Min	Test Frequency	Self-Resonant Frequency Min	DC Resistance Max	Rated DC Current	Case Size (1)
L (μH)	± %	Q	f <sub>t</sub> (MHz)	f <sub>r</sub> (MHz)	R <sub>dc</sub> (Ω)	I <sub>R</sub> (mA)	
180	2, 5, 10	30	0.79	5	28	29	B
220	2, 5, 10	26	0.79	4.5	32	28	B
270	2, 5, 10	26	0.79	4	36	26	B
330	2, 5, 10	24	0.79	3.7	42	24	B
390	2, 5, 10	24	0.79	3.5	46	23	B
470	2, 5, 10	24	0.79	3	68	19	B
560	2, 5, 10	22	0.79	2.8	77	18	B
680	2, 5, 10	20	0.79	2.5	85	17	B
820	2, 5, 10	16	0.79	2	100	16	B
1000	2, 5, 10	12	0.79	1.5	120	15	B

**RANGE OF COMPONENTS – VARIANTS 03, 04 (20K SERIES)**

Inductance	Tolerance	Q Min	Test Frequency	Self-Resonant Frequency Min	DC Resistance Max	Rated DC Current	Case Size (1)
L (μH)	± %	Q	f <sub>t</sub> (MHz)	f <sub>r</sub> (MHz)	R <sub>dc</sub> (Ω)	I <sub>R</sub> (mA)	
0.010	10	60	150	1000	0.04	1000	C
0.012	10	70	150	1000	0.04	1000	C
0.015	10	75	150	1000	0.04	1000	C
0.018	10	75	150	1000	0.04	1000	C
0.022	10	60	100	1000	0.05	1000	C
0.027	10	60	100	1000	0.05	1000	C
0.033	10	60	100	1000	0.05	1000	C
0.039	10	60	100	1000	0.06	900	C
0.047	10	65	100	800	0.06	900	C
0.056	10	65	100	760	0.06	900	C
0.068	10	65	100	700	0.07	840	C
0.082	10	65	100	650	0.07	840	C
0.1	10	65	50	570	0.07	840	C
0.12	10	65	50	520	0.07	840	C
0.15	10	75	50	400	0.08	790	C
0.18	10	75	50	360	0.08	790	C
0.22	10	70	50	320	0.08	790	C
0.27	10	70	50	270	0.1	700	C
0.33	10	70	50	240	0.1	700	C
0.39	10	70	50	220	0.1	700	C
0.47	10	70	25	190	0.14	590	C
0.56	10	70	25	170	0.19	510	C
0.68	10	70	25	160	0.26	430	C
0.82	10	75	25	150	0.3	400	C



Inductance	Tolerance	Q Min	Test Frequency	Self-Resonant Frequency Min	DC Resistance Max	Rated DC Current	Case Size (1)
L (μH)	± %	Q	f <sub>t</sub> (MHz)	f <sub>r</sub> (MHz)	R <sub>dc</sub> (Ω)	I <sub>R</sub> (mA)	
1	10	75	25	130	0.34	380	C
1.2	10	65	7.9	120	0.45	330	C
1.5	10	65	7.9	110	0.57	290	C
1.8	10	65	7.9	100	0.72	260	C
2.2	10	65	7.9	80	0.9	230	C
2.7	10	65	7.9	60	1.1	210	C
3.3	10	60	7.9	50	1.2	200	C
3.9	10	60	7.9	45	1.4	180	C
4.7	10	60	7.9	42	1.6	170	C
5.6	10	65	7.9	40	1.8	160	C
6.8	10	65	7.9	37	2.4	140	C
8.2	10	65	7.9	34	3	130	C
10	10	65	7.9	29	3.5	120	C
12	10	60	2.5	27	3.6	118	C
15	10	60	2.5	22	3.7	115	C
18	10	60	2.5	17	3.8	114	C
22	10	60	2.5	16	3.9	113	C
27	10	65	2.5	15	4	110	C
33	10	65	2.5	14	5	100	C
39	10	65	2.5	13	7	84	C
47	10	70	2.5	12	8	79	C
56	10	70	2.5	11	10	70	C
68	10	65	2.5	10	11	67	C
82	10	60	2.5	9	12	64	C
100	10	60	2.5	8	13	62	C
120	10	40	0.79	7	14	59	C
150	10	40	0.79	6	16	56	C
180	10	40	0.79	5	18	52	C
220	10	40	0.79	4	24	45	C
270	10	40	0.79	3.3	25	44	C
330	10	40	0.79	3.1	29	41	C
390	10	40	0.79	2.9	32	39	C
470	10	35	0.79	2.4	35	37	C
560	10	35	0.79	2.1	45	33	C
680	10	35	0.79	1.9	55	30	C
820	10	30	0.79	1.8	70	26	C
1000	10	30	0.79	1.7	80	25	C

**RANGE OF COMPONENTS – VARIANT 05 (H01 SERIES)**

Inductance	Tolerance	Q Min	Test Frequency	Self-Resonant Frequency Min	DC Resistance Max	Rated DC Current	Case Size (1)
L (μH)	± %	Q	f <sub>t</sub> (MHz)	f <sub>r</sub> (MHz)	R <sub>dc</sub> (Ω)	I <sub>R</sub> (mA)	
0.38	15	30	1	8	0.029	1500	C
0.67	15	30	1	8	0.039	1250	C
1	15	30	1	8	0.054	1000	C
1.5	15	30	1	8	0.073	850	C
2	15	30	1	8	0.1	700	C
2.7	15	30	1	8	0.12	620	C
3.4	15	30	1	8	0.15	550	C
4.6	15	30	1	8	0.19	490	C
5.6	15	30	1	8	0.23	440	C
7.1	15	30	1	8	0.27	410	C
10	15	30	1	8	0.39	340	C
12	15	30	1	8	0.53	290	C
27	15	30	1	8	1.04	200	C
100	15	30	1	8	3.8	100	C

**NOTES:**

1. See Para. 1.6.
2. See Para. 1.8.

1.5 **MAXIMUM RATINGS**

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

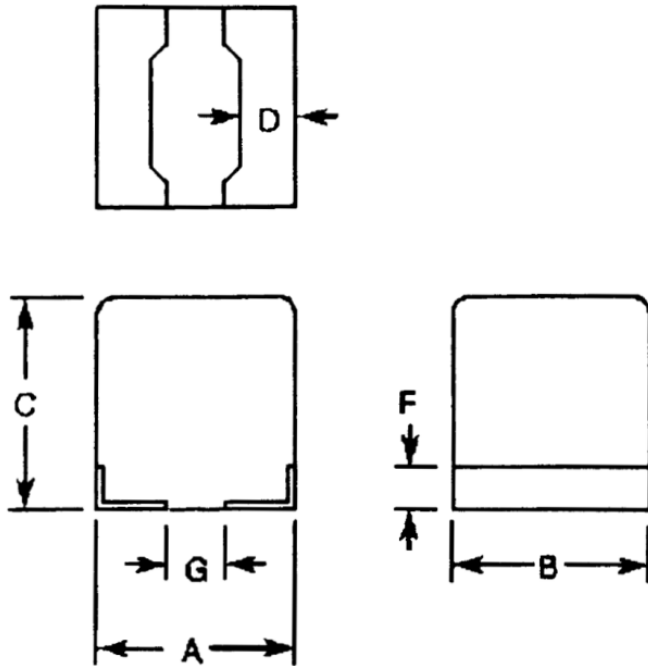
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated DC Current	I <sub>R</sub>	Note 1	mA	
Dielectric Withstanding Voltage	DWV	200	Vrms	
Operating Temperature Range	T <sub>op</sub>	-55 to +125	°C	T <sub>amb</sub>
Storage Temperature Range	T <sub>stg</sub>	-55 to +125	°C	
Soldering Temperature	T <sub>sol</sub>	+260	°C	Note 2

**NOTES:**

1. See Para. 1.4.2, Component Type Variants and Range of Components for values.
2. Duration 5 seconds maximum, the same terminal shall not be resoldered until 3 minutes have elapsed.

1.6 PHYSICAL DIMENSIONS



Symbols	Dimensions (mm)					
	Case Size A		Case Size B		Case Size C	
	Min	Max	Min	Max	Min	Max
A	-	2.8	-	2.8	3.74	4.14
B	-	2.79	-	2.79	2.98	3.45
C	-	2.16	-	2.54	-	3.3
D	0.62	0.9	0.62	0.9	0.7	1.02
F	0.32	0.6	0.32	0.6	0.38	0.64
G	0.72	1.23	0.72	1.23	1.7	-

1.7 FUNCTIONAL DIAGRAM



1.8 MATERIALS AND FINISHES

1.8.1 Case

As a minimum, a resin moulding shall ensure the inductor's protection.

### 1.8.2 Terminals

The terminal material shall be brass, plated with 2 to 3µm of copper, with either SnPb finish (tin content of 50% minimum and 97% maximum, remainder lead) or further underplated with 2 to 3 µm of nickel with Au plated finish, as specified in Para. 1.4.2, Component Type Variants and Range of Components.

For Au finish, the gold thickness is dependent on inductance value as follows:

- 5µm for 0.01 to 1µH.
- 15µm for 1.2µH to 1mH.

## 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) Mechanical Shock: shall not be performed.
- (b) Vibration: shall not be performed.
- (c) Immersion: shall not be performed.
- (d) Moisture Resistance, Polarisation: there shall be no polarising voltage applied during test.
- (e) Operating Life, Operating conditions: No load shall be applied.

### 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 or its primary package shall be:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number (see Para. 1.4.1).
- (c) 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  $T_{amb} = +22 \pm 3^{\circ}C$ .

Characteristics	Symbols	Test Method and Conditions	Tolerance ( $\pm$ %)	Limits		Units
				Min	Max	
Inductance	L	ESCC No. 3201 $f = f_t$ (Note 1) $I = 0A_{dc}$	2	0.98L (Note 1)	1.02L (Note 1)	$\mu H$
			5	0.95L (Note 1)	1.05L (Note 1)	
			10	0.9L (Note 1)	1.1L (Note 1)	
			15	0.85L (Note 1)	1.15L (Note 1)	
Quality Factor	Q	ESCC No. 3201 $f = f_t$ (Note 1) $I = 0A_{dc}$	All	Note 1	-	-
Self-Resonant Frequency	$f_r$	ESCC No. 3201 Note 2	All	Note 1	-	MHz
DC Resistance	$R_{DC}$	ESCC No. 3201	All	-	Note 1	$\Omega$
Insulation Resistance	$R_i$	ESCC No. 3201	All	1000	-	M $\Omega$

**NOTES:**

- See Para. 1.4.2, Component Type Variants and Range of Components for values.
- Measurement shall be performed on a go-no-go basis.

2.3.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Unit
			Min	Max	
Inductance Change between $-55 (+3 -0)^{\circ}C$ and $+22 \pm 3^{\circ}C$	$\Delta L/L$	See Para. 2.3.1	-15	+10	%
Inductance Change between $+125 (+0 -3)^{\circ}C$ and $+22 \pm 3^{\circ}C$	$\Delta L/L$	See Para. 2.3.1	-10	+15	%

**NOTES:**

- Performed only for qualification or qualification maintenance. The measurements shall be performed on a sample of 5 components from the lot with 0 failures allowed. In the event of any failure a 100% inspection may be performed.

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	Symbols	Limits		Units
			Min	Max	
Thermal Shock	DC Resistance	$R_{DC}$	Note 1		$\Omega$
Barometric Pressure Whilst at low pressure:	Dielectric Withstanding Voltage (2) DWV Leakage Current (3)	DWV $I_L$	200 -	- 100	Vrms $\mu A$
Temperature Rise Initial Measurements	DC Resistance (at $0.1I_R$ )	$R_{DC}$	Record Value		$\Omega$
Final Measurements (within 30s of the removal of power)	DC Resistance (at $I_R$ ) Temperature Rise	$R_{DC}$ $\Delta T$	-	25	$\Omega$ $^{\circ}C$
Overload	DC resistance Insulation Resistance Dielectric Withstanding Voltage (2) DWV Leakage Current (3)	$R_{DC}$ $R_i$ DWV $I_L$	Note 1 1000 200 -	- - 100	$\Omega$ M $\Omega$ Vrms $\mu A$
Resistance to Soldering Heat	Inductance Quality Factor Self-Resonant Frequency DC resistance Dielectric Withstanding Voltage (2) DWV Leakage Current (3)	L Q $f_r$ $R_{DC}$ DWV $I_L$	Note 1 Note 1 Note 1 Note 1 200 -	- - - - 100	$\mu H$ - MHz $\Omega$ Vrms $\mu A$
Moisture Resistance Within 30 min of removal from conditioning:	Dielectric Withstanding Voltage (2) DWV Leakage Current (3) Insulation Resistance	DWV $I_L$ $R_i$	200 -	- 100	Vrms $\mu A$ M $\Omega$
Within 1 hour of previous measurements:	Inductance Quality Factor Self-Resonant Frequency DC resistance	L Q $f_r$ $R_{DC}$	Note 1 Note 1 Note 1 Note 1		$\mu H$ - MHz $\Omega$

Test Reference per ESCC No. 3201	Characteristics	Symbols	Limits		Units
			Min	Max	
Operating Life					
Initial Measurement (0 hour)	Inductance	L	Note 1		μH
Intermediate Measurements (1000 hours)(after 30 min recovery)	Dielectric Withstanding Voltage (2)	DWV	200	-	Vrms
	DWV Leakage Current (3)	I <sub>L</sub>	-	100	μA
	Inductance Change	ΔL/L	-10 or (4) -5	+10 or (4) +5	%
Final Measurements (2000 hours)(after 30 min recovery)	Dielectric Withstanding Voltage (2)	DWV	200	-	Vrms
	DWV Leakage Current (3)	I <sub>L</sub>	-	100	μA
	Inductance Change	ΔL/L	-10 or (4) -5	+10 or (4) +5	%
	Quality Factor	Q	Note 1		-
	Self-Resonant Frequency	f <sub>r</sub>	Note 1		MHz
	DC resistance	R <sub>DC</sub>	Note 1		Ω
	Insulation Resistance	R <sub>i</sub>	100	-	MΩ

**NOTES:**

1. See Para. 1.4.2, Component Type Variants and Range of Components for values.
2. Test method and conditions per ESCC No. 3201.
3. Measured during Dielectric Withstanding Voltage.
4. L < 0.1μH or L ≥ 0.1 μH respectively.

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	-	No Load	mA

APPENDIX A

**AGREED DEVIATIONS FOR EXXELIA MAGNETICS (F)**

Items Affected	Description of Deviations																																	
Deviations from Generic Specification: Qualification and Periodic Tests (Chart F4)	Para. 8.17, Solderability: Final Examination: exposed base metal at the edge of the lead frame is permitted.																																	
Characteristics Codes (Para. 1.4.1.1)	<p>For Variants 01, 02, 03 and 04, in addition to the Inductance Value characteristic code used for the ESCC Component Number, Inductance Value may also be marked on the top of the body using three coloured bands as follows. The unit quantity shall be nanohenries (nH):</p> <table border="1" data-bbox="568 651 994 1131"> <thead> <tr> <th>Colour</th> <th>Significant Figure</th> <th>Multiplier (nH)</th> </tr> </thead> <tbody> <tr><td>Black</td><td>0</td><td>10<sup>0</sup></td></tr> <tr><td>Brown</td><td>1</td><td>10<sup>1</sup></td></tr> <tr><td>Red</td><td>2</td><td>10<sup>2</sup></td></tr> <tr><td>Orange</td><td>3</td><td>10<sup>3</sup></td></tr> <tr><td>Yellow</td><td>4</td><td>10<sup>4</sup></td></tr> <tr><td>Green</td><td>5</td><td>10<sup>5</sup></td></tr> <tr><td>Blue</td><td>6</td><td>-</td></tr> <tr><td>Violet</td><td>7</td><td>-</td></tr> <tr><td>Grey</td><td>8</td><td>-</td></tr> <tr><td>White</td><td>9</td><td>-</td></tr> </tbody> </table> <p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1. The first, wider band represents the 1st significant figure.</li> <li>2. The second, narrower band represents the 2nd significant figure.</li> <li>3. The third, narrower band represents the multiplier.</li> </ol>	Colour	Significant Figure	Multiplier (nH)	Black	0	10 <sup>0</sup>	Brown	1	10 <sup>1</sup>	Red	2	10 <sup>2</sup>	Orange	3	10 <sup>3</sup>	Yellow	4	10 <sup>4</sup>	Green	5	10 <sup>5</sup>	Blue	6	-	Violet	7	-	Grey	8	-	White	9	-
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