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FUSES, 0.14 TO 3.5 AMPS

BASED ON TYPE MGA-S

ESCC Detail Specification No. 4008/001

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DCR No.	CHANGE DESCRIPTION

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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. 4008.

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: 400800101

- Detail Specification Reference: 4008001
- Component Type Variant Number: 01 (as required)

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	Rated Current (A)	Rated Voltage (VAC)	Rated Voltage (VDC)	Cold Resistance (mΩ)		Voltage Drop (mV) at Nominal Current (Note 1)		Weight Max (g)
				Min	Max	Min	Max	
01	0.14	125	125	867	1173	205	310	0.035
02	0.175	125	125	680	920	200	300	0.035
03	0.262	125	125	307	415	132	198	0.035
04	0.35	125	125	204	290	120	180	0.035
05	0.525	125	125	92.2	138.5	80	120	0.035
06	0.7	125	125	83.9	113.4	99	148	0.035
07	1.05	125	125	47.6	64.3	84	126	0.035
08	1.4	125	125	33.1	44.8	78	118	0.035
09	1.75	125	125	25	33.9	72	108	0.035
10	2.1	125	125	20.4	27.7	70	106	0.035
11	2.8	63	125	14.4	19.5	67	100	0.035
12	3.5	32	125	11.4	15.5	70	110	0.035

NOTES:

1. Nominal Current = 143% Rated Current. Fuses shall be capable of carrying the Nominal Current for 4 hours minimum without blowing.

1.5 MAXIMUM RATINGS

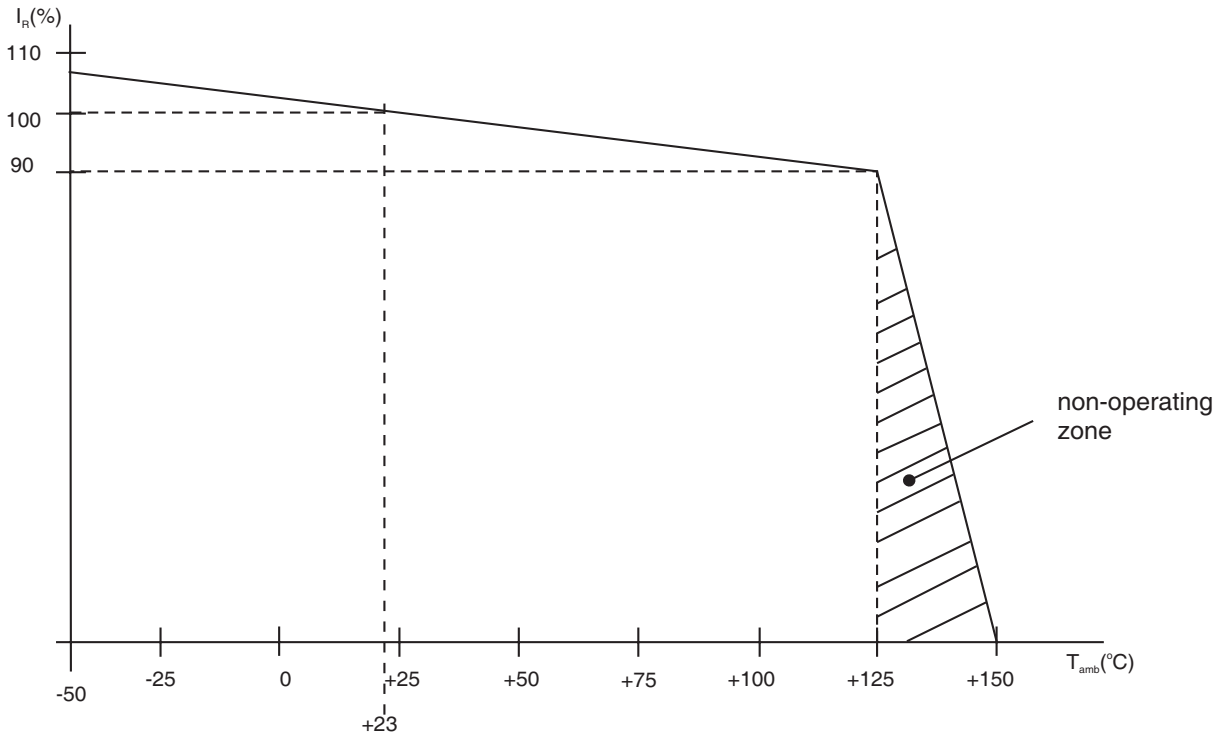
The maximum ratings shall not be exceeded at any time during use or storage.
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated Current	I_R	Note 1	A	AC and DC
Rated Voltage	U_R	Note 1	V	AC or DC
AC Interrupt Current	-	50	A	At maximum Rated Voltage. Power factor > 0.95
DC Interrupt Current Variants 01 to 10 Variants 11 and 12	-	 300 50	A	At maximum Rated Voltage. Time Constant ≤ 1ms
Operating Temperature Range	T_{op}	-50 to +125	^oC	90%I_R to 107%I_R
Storage Temperature Range	T_{stg}	-55 to +150	^oC	
Soldering Temperature	T_{sol}	+260	^oC	Note 2

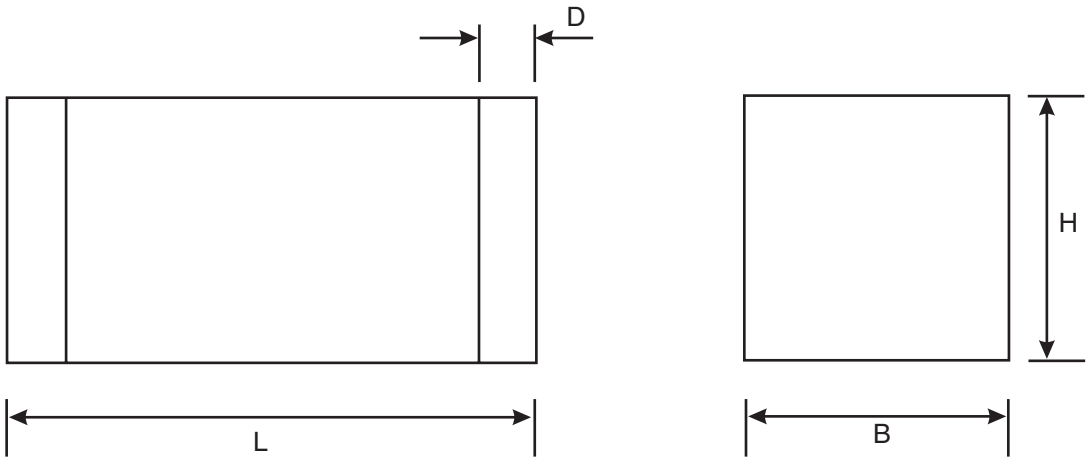
NOTES:

1. The Rated Current and maximum Rated Voltage are specified in Component Type Variants and Range of Components.
2. 10 seconds maximum and the same terminal may only be resoldered on one more occasion and after a minimum of 10 minutes have elapsed.

1.6 PARAMETER DERATING INFORMATION



1.7 PHYSICAL DIMENSIONS



Symbols	Dimensions mm	
	Min	Max
L	3	3.4
B	1.35	1.75
H	1.35	1.75
D	0.3	0.7

1.8 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

(a) Body : Ceramic
(b) Terminal material : Copper
(c) Terminal plating : Electrolytic Nickel of thickness 1µm minimum and 5µm maximum over electrolytic Copper of thickness 0.3µm minimum and 2µm maximum, with an electrolytic Tin-lead final finish of thickness 5µm minimum and 15µm maximum. The composition of the Tin-lead shall be 65 to 95% tin, remainder lead.

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 Chart F4 - Qualification and Periodic Tests

(a) Rapid Change of Temperature: the number of cycles shall be 200.
(b) Vibration: shall not be performed.

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 components symbol (for ESCC qualified components only).
(b) The ESCC Component Number.

(c) Traceability information.

2.3 CURRENT CARRYING CAPACITY TEST

Ref. Current Carrying Capacity in the ESCC Generic Specification.

Test Current : Nominal Current, DC, as specified in Component Type Variants and Range of Components.
Duration : 4 hours minimum.
Test temperature : +22 ±3°C.

2.4 OVERLOAD OPERATION TEST

Ref. Overload Operation in the ESCC Generic Specification.

Overload Current	Pre-arcing Time (ms)	
	Min	Max
357% I_R	2	5000
571% I_R	0.5	10
857% I_R	0.05	2

2.5 VERIFICATION OF OVERLOAD OPERATION AT DC RATED VOLTAGE TEST

Ref. Verification of Overload Operation at DC Rated Voltage in the ESCC Generic Specification.

2.5.1 Verification of Overload Operation at DC Rated Voltage, T_{amb} = +22 ±3°C

Overload Current	Pre-arcing Time (ms)	
	Min	Max
357% I_R	2	5000
357% I_R	0.5	10
50A	N/A (Note 2)	
300A (Note 1)	N/A (Note 2)	

NOTES:

1. Not applicable for Variants 11 and 12.
2. The fuse shall open the test circuit. The following criteria shall apply:
   The circuit shall remain energized for 30 seconds minimum without any indication of closing.
   The insulation shall not puncture. The terminals shall not separate from the body.
   The terminals and the body shall not rupture and the terminals shall not be shunted.

2.5.2 Verification of Overload Operation at DC Rated Voltage, T_{amb} =-50(+5, -0)°C

Overload Current	Pre-arcing Time (ms)	
	Min	Max
365% I_R	2	5000
605% I_R	0.5	10
50A	N/A (Note 2)	
300A (Note 1)	N/A (Note 2)	

NOTES:
1. Not applicable for Variants 11 and 12.
2. The fuse shall open the test circuit. The following criteria shall apply:
   The circuit shall remain energized for 30 seconds minimum without any indication of closing.
   The insulation shall not puncture. The terminals shall not separate from the body.
   The terminals and the body shall not rupture and the terminals shall not be shunted.

2.6 INSULATION RESISTANCE TEST

Ref. Insulation Resistance in the ESCC Generic Specification.

Test Condition : A.
Test Temperature: T_{amb} =+22 ±3°C
Test Limit: 20kΩ minimum.

2.7 CURRENT CLEARING TEST

Ref. Thermal Vacuum in the ESCC Generic Specification.

The maximum current clearing I^2t value for each component type variant is given below.

Variant Number	Maximum Current Clearing I^2t at 571%I_R (DC) (A^2 s)
01	0.0064
02	0.01
03	0.0225
04	0.04
05	0.09
06	0.16
07	0.36
08	0.64
09	1
10	1.44
11	2.56
12	4

2.8 ROOM TEMPERATURE ELECTRICAL MEASUREMENTS

The measurements shall be performed at T_{amb}=+22 ±3°C.

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Cold Resistance	R	ESCC No. 4008 Para. 8.1.1.1	See Component Type Variants and Range of Components		mΩ
Voltage Drop	VD	ESCC No. 4008 Para. 8.1.1.2	See Component Type Variants and Range of Components		mV

2.9 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at T_{amb}=+22 ±3°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. 4008	Characteristics	Symbols	Limits		Units
			Min	Max	
Operating Life Initial Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop	VD	See Component Type Variants and Range of Components		mV
Operating Life Mid-point Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
Operating Life Final Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop	VD	See Component Type Variants and Range of Components		mV

Test Reference per ESCC No. 4008	Characteristics	Symbols	Limits		Units
			Min	Max	
	Voltage Drop Drift (from initial measure-ment)	$\frac{\Delta V}{VD}$	-	±20	%
Rapid Change of Temperature Final Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop Note 1	VD	See Component Type Variants and Range of Components		mV
Vibration Final Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop Note 1	VD	See Component Type Variants and Range of Components		mV
Shock Final Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop Note 1	VD	See Component Type Variants and Range of Components		mV
Damp Heat, Steady State Final Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop Note 1	VD	See Component Type Variants and Range of Components		mV
Resistance to Soldering Heat					
Final Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop Note 1	VD	See Component Type Variants and Range of Components		mV
Robustness of Terminations					

Test Reference per ESCC No. 4008	Characteristics	Symbols	Limits		Units
			Min	Max	
Final Measurements	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ
	Voltage Drop Note 1	VD	See Component Type Variants and Range of Components		mV
Thermal Vacuum Final Measurements Overloaded fuses	Insulation Resistance at 100V ±10% Each terminal and case Between the terminals	R_i	 20 20	 - -	kΩ
Remaining fuses	Cold Resistance	R	See Component Type Variants and Range of Components		mΩ

NOTES:

1. Voltage drop shall be omitted if additional tests are to be performed on the same fuse. In such cases voltage drop shall only be measured during the initial measurements of the first test and during the final measurements of the last test.

2.10 BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+80 (+0 -3)	^oC
Test Current	I	95.7% I_R (Note 1)	A

NOTES:

1. For I_R, see Component Type Variants and Range of Components.

2.11 OPERATING LIFE CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+125 (+0 -3) (Note 1)	^oC
Test Current	I	95% I_R (Note 1)	A

NOTES:

1. For I_R, see Component Type Variants and Range of Components.

APPENDIX 'A'

AGREED DEVIATIONS FOR SCHURTER (CH)

Items Affected	Description of Deviations
Deviations from Production Control - Chart F2, Screening Tests - Chart F3 and Qualification and Periodic Tests - Chart F4, Subgroups 1, 2 and 3	External Visual Inspection (Ref. ESCC Basic Specification No. 20500). Any void in the ceramic with a maximum surface dimension or depth of ≤ 0.12mm shall be considered acceptable. Any brown spot on the ceramic with a diameter ≤0.5mm shall be considered acceptable. Any tin particle on the ceramic with an area ≤0.02mm^2 shall be considered acceptable.
Deviations from Qualification and Periodic Tests - Chart F4, Para 8.4 (Solderability)	In addition to the inspection criteria of IEC 60068-2-20, Test Ta, Method 1, any void in the solder which is ≤0.3mm deep shall be considered acceptable.
Deviations from Qualification and Periodic Tests - Chart F4, Para 8.15 (Thermal Vacuum)	The maximum vacuum chamber pressure during Thermal Vacuum test shall be 5 x 10^{-2} torr.