Littelfuse

Expertise Applied | Answers Delivered

15th January 2023

To: Valued Customer

From: Littelfuse Product Management

Subject: Thin Film 440 (1.75A and above) and 441 series

This is a 60 day PCN.

Based on the above reference, Littelfuse will be implementing an alternative construction of the following existing Thin Film Fuse series;

- 440 series :1.75A to 8A inclusive
- 441 series :2A to 6A inclusive

Relative to electrical specifications, the nominal resistance of all the part numbers are similar. The nominal i2t performance for the revised version, however, is typically similar or higher in most cases which translates to a more robust fuse.

There will be no changes to the part number. It will be a running change within production.

Please see attached for the physical differences on the fuses.

440	441
1.75A to 8A inclusive	2A to 6A inclusive
04401.75WR	**0441002.WR**
0440002.WR	**044102.5WR**
044002.5WR	**0441003.WR**
0440003.WR	**044103.5WR**
044003.5WR	**0441004.WR**
0440004.WR	**0441005.WR**
0440005.WR	**0441006.WR**
0440007.WR	
0440008.WR	

Please see attachments for the

- Validation reports

Validation Test Report for 441 Series

Validation Test Report for 440 (1.75A

- Comparison of the physical fuse itself and the electrical performance (i2t, resistance, dimension).

Comparison of Existing and New 440

- Table of affected part numbers in SAP.

440 and 441 affected part numbers for PCN

Timeframe

The effective date of this change is 15th March 2023. We would be doing a running change in production on 15th March 2023

Samples are available upon request.

Best regards;

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Electronics Business Unit
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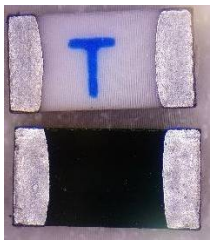
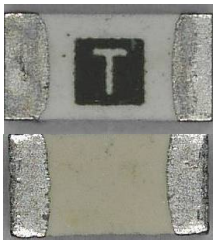
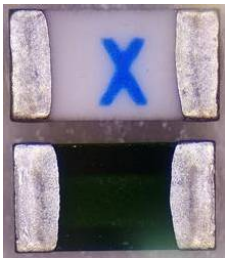
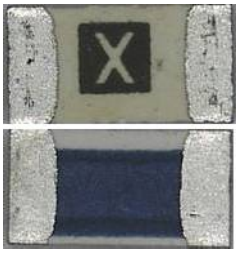
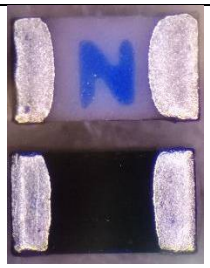
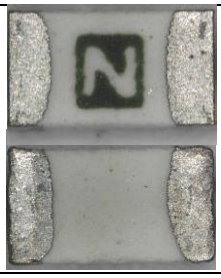
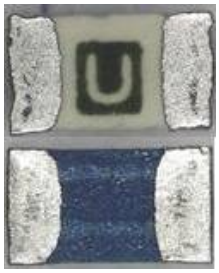
Comparison of Existing and New 440 and 441 Series

Electrical Characteristic Summary

Series	Rating	Nominal Resistance (Ω)		Nominal Melting I^2t ($Asec^2$)	
		Existing	New	Existing	New
440	1.75A	0.045	0.045	0.3312	0.400
	2A	0.0385	0.0385	0.4326	0.470
	2.5A	0.0285	0.0285	0.8191	0.820
	3A	0.02252	0.02252	1.232	1.247
	3.5A	0.01845	0.01845	1.789	2.380
	4A	0.01553	0.01553	2.601	3.136
	5A	0.012	0.012	4.761	5.949
	7A	0.00753	0.00753	8.464	10.38
	8A	0.00634	0.00634	12.95	13.03
441	2A	0.0302	0.0302	0.3103	0.300
	2.5A	0.02	0.02	0.552	0.640
	3A	0.0158	0.0158	0.8165	1.100
	3.5A	0.0117	0.0117	0.9438	1.270
	4A	0.0097	0.0097	1.2659	1.710
	5A	0.0073	0.0073	1.6287	2.880
	6A	0.0056	0.0056	2.6049	4.390

Part Identification

Series	Existing	New
440 (1.75A – 5A)		
440 (7A – 8A)		
441 (2A – 3.5A)		
441 (4A-6A)		

Dimension

Series	Rating	Dimension (mm)	
		Existing	New
440 (1.75A-8A)	Length	3.20 ± .1778	3.20 ± .1778
	Width	1.63 + .10/-.20	1.63 + .10/-.20
	Height	0.8179 +.046/-0.076	0.835 ± .15
441 (2A – 6A)	Length	1.540 ± .15	1.582 ± .152
	Width	0.850 ± .15	0.828 ± .152
	Height	0.502± .08	0.508 ± .102

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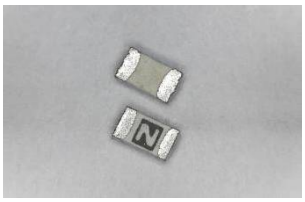
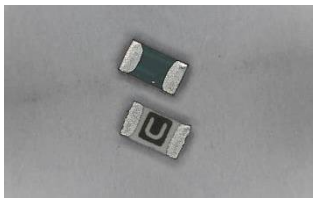
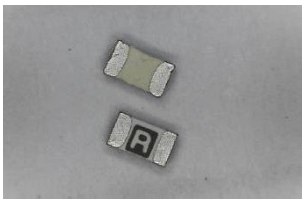
January 11, 2023

Validation Test Report for 441 Series Ceramic Chip Fuse







Part Number
0441002.WR
044102.5WR
0441003.WR
044103.5WR
0441004.WR
0441005.WR
0441006.WR

This document is a summary of tests and results to validate the conformance of 441 Series (2A – 6A) Ceramic Chip fuses to Validation Test Requirements

Section 1 – INTRODUCTION

1.1. Key Objective

To validate the conformance of 441 Ceramic Chip Fuse (CCF) series to Validation Test stress test requirements and verify its suitability to automotive applications. The ratings tested for full validation tests include the lowest and highest rating of 441 Series: 2A and 6A. The results of the full validation tests will represent all other ratings of the 441 series.

1.2. Agency Approvals

UL recognized (cURus)

1.3. Sample Preparation

All samples (unless specified otherwise in succeeding sections of this report) underwent:

1. Loose resistance measurement using Tegam® meter and four-point probe.
2. Mounting onto appropriate10-position test boards with one time exposure to reflow profile (*Fig.1)*, having a peak temperature of 261.6 °C at the board surface. Fuses were mounted using Kester Easy Profile 256LF (96.5Sn/3.0Ag/0.5Cu) lead-free solder paste.

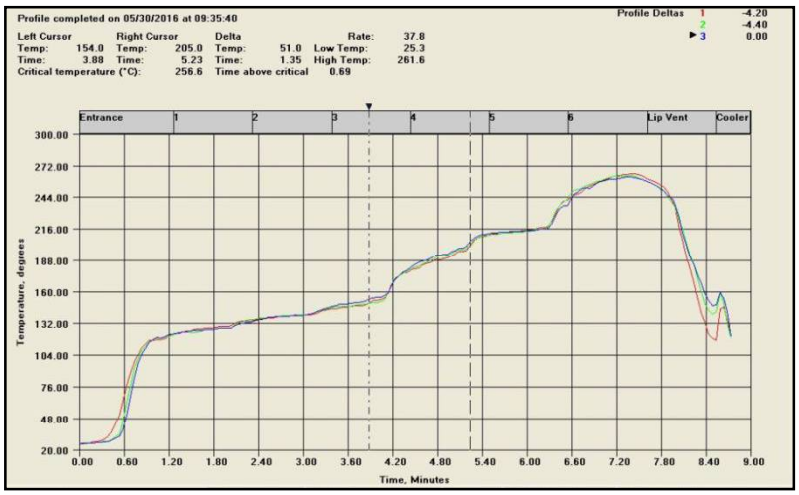


Figure 1. Lead-Free Reflow Oven Profile

3. One hour cooling at room ambient temperature.
4. On-board resistance measurement after reflow.

1.4. Post Tests

To prove compliance, all tests except electrical characterization tests underwent post Life Test for four (4) hours and Overload Test at 350% of fuse rated current.

1.5. Product Specifications

Resistance/Voltage Drop/Interrupting Rating

Part Number	Nominal Resistance (Ω)	Nominal Voltage Drop @ Rated Current (V)	Interrupting Rating
0441002.WR	0.0302	0.0551	50 A @ 32 VDC
044102.5WR	0.0200	0.0534	50 A @ 32 VDC
0441003.WR	0.0158	0.0531	50 A @ 32 VDC
044103.5WR	0.0117	0.0468	50 A @ 32 VDC
0441004.WR	0.0097	0.0475	50 A @ 32 VDC
0441005.WR	0.0073	0.0472	50 A @ 32 VDC
0441006.WR	0.0056	0.0464	50 A @ 32 VDC

Electrical Characteristics

% Overload	Ampere Rating	Opening Time (Sec)
100%	2A – 6A	4 Hours Minimum
350%	2A – 6A	5 Sec Maximum

Section 2 – TESTS AND RESULTS

1. **THERMAL SHOCK TEST** -30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202, Method 107, Condition B
Test Condition: Subject fuses to 100 temperature cycles
15 min. at –55°C lowest temp and 15 min. at 150°C highest temp
Post resistance measurement.
Results: All fuses passed successfully.

0441002.WR - Thermal Shock														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	28.890	30.567	34.110	1.281	29.080	30.960	36.010	1.705	1000 Cycles Thermal Shock	28.830	30.777	36.180	1.793	PASSED
2	29.130	30.629	32.580	0.831	29.260	30.736	32.470	0.782		29.100	30.537	32.240	0.784	PASSED
3	27.340	30.410	36.070	1.679	27.510	30.475	36.170	1.658		27.290	30.397	36.150	1.676	PASSED

0441002.WR - Thermal Shock Post Test														
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	29.420	31.053	36.170	1.630	PASSED	7A	0.014	0.103	0.156	0.041	PASSED
2		29.270	30.604	32.630	0.849	PASSED		0.086	0.109	0.150	0.019	PASSED
3		27.350	30.691	36.220	2.067	PASSED		0.083	0.128	0.171	0.025	PASSED

044103.5WR - Thermal Shock														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	10.970	11.878	13.380	0.491	11.260	12.048	13.550	0.479	1000 Cycles Thermal Shock	11.360	12.104	13.490	0.451	PASSED
2	10.810	11.939	14.300	0.708	11.090	12.095	14.480	0.714		11.170	12.213	14.680	0.724	PASSED
3	10.650	11.716	13.260	0.651	10.880	11.896	13.740	0.675		10.900	11.874	13.700	0.676	PASSED

044103.5WR - Thermal Shock Post Test														
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	11.170	11.762	12.250	0.287	PASSED	12.25A	0.434	0.752	1.740	0.375	PASSED
2		10.920	11.776	12.860	0.586	PASSED		0.352	0.802	1.571	0.312	PASSED
3		10.880	11.869	13.590	0.745	PASSED		0.494	1.291	2.624	0.612	PASSED

0441006.WR - Thermal Shock														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.630	6.845	6.990	0.087	7.034	7.212	7.393	0.099	1000 Cycles Thermal Shock	7.037	7.210	7.377	0.099	PASSED
2	6.490	6.853	6.990	0.119	6.953	7.242	7.428	0.118		6.947	7.240	7.415	0.125	PASSED
3	6.650	6.866	6.980	0.082	7.051	7.188	7.326	7.124		6.902	7.167	7.320	0.101	PASSED

0441006.WR - Thermal Shock Post Test														
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	7.042	7.189	7.292	0.084	PASSED	21A	0.154	0.176	0.202	0.015	PASSED
2		6.940	7.188	7.395	0.124	PASSED		0.160	0.175	0.192	0.010	PASSED
3		7.090	7.191	7.317	0.067	PASSED		0.165	0.182	0.207	0.012	PASSED

2. BIASED HUMIDITY - 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: JESD22 - A110-B
Test Condition: Subject fuses to 85°C/85% RH with 10% operating current for 1000 hrs.
Measure fuse resistance at 168hrs and 336hrs.
Examine visually after test
Post resistance measurement
Results: All fuses passed successfully.

0441002.WR - Biased Humidity

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Onboard Resistance @ 168Hrs mΩ				Onboard Resistance @ 336Hrs mΩ				Onboard Resistance @ 1000Hrs mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	28.830	31.650	34.670	1.527	28.920	31.713	34.540	1.501	28.950	31.788	34.700	1.517	28.840	31.651	34.490	1.510	28.770	31.626	34.570	1.515	PASSED
2	27.700	30.676	32.470	0.931	27.740	30.750	32.480	0.938	27.770	30.829	32.500	0.930	27.630	30.627	32.340	0.926	27.597	30.569	32.270	0.923	PASSED
3	27.520	30.323	33.190	1.603	27.720	30.301	33.510	1.629	27.790	30.403	33.730	1.654	27.570	30.171	33.380	1.640	27.520	30.112	33.300	1.635	PASSED

0441002.WR - Biased Humidity Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	28.670	31.185	34.320	1.736	PASSED	7A	0.044	0.087	0.132	0.024	PASSED
2		29.490	30.627	32.190	0.777	PASSED		0.084	0.108	0.191	0.027	PASSED
3		27.790	29.808	31.860	1.326	PASSED		0.069	0.118	0.214	0.041	PASSED

044103.5WR - Biased Humidity

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Onboard Resistance @ 168Hrs mΩ				Onboard Resistance @ 336Hrs mΩ				Onboard Resistance @ 1000Hrs mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	11.190	11.754	13.310	0.488	11.270	11.876	13.530	0.521	11.220	11.836	13.510	0.521	11.250	11.854	13.540	0.522	11.220	11.839	13.520	0.533	PASSED
2	11.290	12.039	13.360	0.480	11.430	12.155	13.560	0.477	11.380	12.102	13.560	0.481	11.400	12.114	13.580	0.483	11.470	12.178	13.730	0.493	PASSED
3	10.780	11.809	13.280	0.589	10.770	11.927	13.450	0.602	10.700	11.863	13.350	0.597	10.730	11.873	13.360	0.596	10.680	11.827	13.380	0.607	PASSED

044103.5WR - Biased Humidity Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	11.160	11.781	13.390	0.561	PASSED	12.25A	0.275	0.887	1.257	0.294	PASSED
2		11.370	12.015	13.580	0.589	PASSED		0.274	0.632	1.087	0.227	PASSED
3		10.650	11.737	12.850	0.582	PASSED		0.314	0.809	1.184	0.284	PASSED

0441006.WR - Biased Humidity

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Onboard Resistance @ 168Hrs mΩ				Onboard Resistance @ 336Hrs mΩ				Onboard Resistance @ 1000Hrs mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.480	6.846	6.990	0.124	6.811	7.231	7.477	0.137	6.778	7.206	7.457	0.137	6.804	7.232	7.489	0.137	6.757	7.175	7.414	0.135	PASSED
2	6.300	6.851	6.990	0.132	6.695	7.249	7.415	0.135	6.684	7.241	7.414	0.138	6.708	7.253	7.413	0.135	6.639	7.187	7.358	0.134	PASSED
3	6.570	6.864	6.990	0.117	6.941	7.210	7.363	0.115	6.927	7.185	7.435	0.130	6.972	7.229	7.403	0.117	6.792	7.150	7.313	0.124	PASSED

0441006.WR - Biased Humidity Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	7.092	7.242	7.421	0.078	PASSED	21A	0.154	0.181	0.232	0.020	PASSED
2		7.067	7.235	7.373	0.086	PASSED		0.159	0.179	0.248	0.021	PASSED
3		6.918	7.123	7.281	0.116	PASSED		0.150	0.175	0.211	0.015	PASSED

3. HIGH TEMPERATURE OPERATIONAL LIFE- 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 108, Test Condition D
Test Condition: Place fuses in a chamber at 150°C for 1000hrs
Apply de-rated current: (Fuse Rating) x (% Temp de-rating) x 75% (Standard de-rating)
Measure fuses resistance at 168hrs and 336hrs
Examine visually after the test
Post resistance measurement
Results: All fuses passed successfully.

0441002.WR High Temperature Operational Life

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Onboard Resistance @ 168Hrs mΩ				Onboard Resistance @ 336Hrs mΩ				Onboard Resistance @ 1000Hrs mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	28.100	30.592	33.110	1.132	28.120	30.614	33.160	1.124	28.370	30.817	33.540	1.168	28.410	30.714	33.460	1.141	28.100	30.482	33.030	1.110	PASSED
2	28.780	30.933	32.630	0.950	28.900	31.011	32.560	0.943	29.110	31.130	32.930	0.953	28.880	31.000	32.760	0.971	29.020	30.878	32.660	0.969	PASSED
3	27.850	30.737	34.970	1.713	28.100	30.817	34.890	1.699	28.120	30.957	35.020	1.688	27.960	30.782	34.780	1.664	27.790	30.604	34.630	1.640	PASSED

044103.5WR - High Temperature Operational Life

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Onboard Resistance @ 168Hrs mΩ				Onboard Resistance @ 336Hrs mΩ				Onboard Resistance @ 1000Hrs mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	10.810	11.608	12.590	0.409	11.010	11.889	13.420	0.498	11.000	11.860	13.420	0.496	11.030	11.846	13.430	0.500	10.980	11.880	13.780	0.544	PASSED
2	11.080	12.066	13.830	0.574	11.280	12.273	14.010	0.570	11.250	12.252	13.970	0.567	11.230	12.241	13.960	0.568	11.310	12.273	13.940	0.565	PASSED
3	11.070	11.800	13.360	0.640	11.160	11.878	13.320	0.611	11.120	11.863	13.290	0.604	11.130	11.855	13.270	0.604	11.080	11.823	13.200	0.604	PASSED

0441006.WR - High Temperature Operational Life

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Onboard Resistance @ 168Hrs mΩ				Onboard Resistance @ 336Hrs mΩ				Onboard Resistance @ 1000Hrs mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.630	6.835	6.970	0.101	7.018	7.255	7.434	0.123	7.013	7.261	7.457	0.128	6.981	7.235	7.415	0.128	7.012	7.270	7.452	0.130	PASSED
2	6.630	6.835	6.990	0.096	6.987	7.225	7.391	0.103	6.992	7.235	7.403	0.105	6.988	7.219	7.377	0.109	7.004	7.257	7.433	0.109	PASSED
3	6.260	6.781	6.920	0.131	6.553	7.129	7.324	0.149	6.551	7.141	7.342	0.154	6.571	7.131	7.372	0.154	6.543	7.151	7.335	0.157	PASSED

4. PHYSICAL DIMENSION – 30 fuses per lot

Criteria: The fuses shall meet individual part specifications
Test Reference: JESD22 Method JB-100
Test Condition: Verify physical dimensions of fuses.
Results: All fuses passed successfully.

SPECIFICATIONS					
FUSE LENGTH		FUSE WIDTH		FUSE THICKNESS	
Min	Max	Min	Max	Min	Max
1.430	1.734	0.676	0.980	0.406	0.610

Physical Dimension

Part No.	Lot No.	Fuse Length mm		Fuse Width mm		Fuse Thickness mm		Test Result
		Min.	Max.	Min.	Max.	Min.	Max.	
0441002.WR	1	1.549	1.600	0.787	0.889	0.483	0.580	PASSED
	2	1.549	1.600	0.813	0.889	0.483	0.580	PASSED
	3	1.549	1.600	0.813	0.889	0.508	0.580	PASSED
044103.5WR	1	1.575	1.626	0.813	0.876	0.508	0.546	PASSED
	2	1.588	1.613	0.826	0.876	0.508	0.495	PASSED
	3	1.575	1.626	0.813	0.864	0.495	0.533	PASSED
0441006.WR	1	1.520	1.550	0.840	0.880	0.480	0.510	PASSED
	2	1.500	1.510	0.880	0.900	0.500	0.530	PASSED
	3	1.510	1.550	0.850	0.900	0.480	0.500	PASSED

5. RESISTANCE TO SOLVENTS -30 fuses per lot

Criteria: Visual Examination
Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 215K
Test Condition: a.) 1:3 Mixture by volume of isopropyl alcohol to mineral spirits
b.) EC-7R (Bioact)
c.) 42:1:1 mixture by volume of water to propylene glycol monomethylether to monoethanolamine
Examine visually after the test
Post resistance measurement
Results: All fuses passed successfully.

0441002.WR - Resistance to Solvents														
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	28.630	31.006	33.420	1.525	28.840	31.542	34.030	1.794	1:3 Mixture by volume of isopropyl alcohol to mineral spirits	28.690	31.367	33.840	1.792	
2	28.580	30.727	32.330	1.110	29.020	31.143	32.820	1.104		28.870	30.986	32.650	1.099	PASSED
3	27.980	30.312	33.070	1.735	28.330	30.441	33.510	1.516		28.170	30.279	33.330	1.508	

0441002.WR - Resistance to Solvents														
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	28.490	30.219	31.540	0.838	29.890	30.898	32.010	0.706	EC-7R (Bioact)	29.750	30.741	31.860	0.701	
2	29.010	30.506	33.060	1.114	29.330	31.005	33.530	1.433		29.160	30.842	33.350	1.424	PASSED
3	29.470	31.177	34.680	1.698	28.710	31.447	36.890	2.545		28.520	31.258	36.670	2.534	

0441002.WR - Resistance to Solvents														
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	29.250	30.618	33.320	1.194	29.720	31.152	33.870	1.159	42:1:1 mixture by volume of water to propylene glycol monomethylether to monoethanolamine	29.570	30.987	33.710	1.159	
2	29.670	30.209	31.650	0.632	29.980	30.851	33.150	1.019		29.780	30.656	32.930	1.014	PASSED
3	28.160	30.312	36.290	2.343	28.600	30.657	33.160	1.276		28.350	30.415	32.910	1.278	

044103.5WR - Resistance to Solvents													
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	11.340	11.533	11.760	0.152	11.430	11.687	11.940	0.172	1:3 Mixture by volume of isopropyl alcohol to mineral spirits	11.330	11.593	11.840	0.175	
2	10.950	11.663	12.400	0.519	11.090	11.781	12.510	0.476		11.020	11.710	12.440	0.468	PASSED
3	10.950	11.619	12.310	0.487	11.220	11.740	12.340	0.425		11.160	11.678	12.280	0.420	

044103.5WR - Resistance to Solvents													
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	10.860	11.501	12.980	0.613	11.120	11.663	13.100	0.569	EC-7R (Bioact)	11.040	11.580	13.010	0.565	
2	11.200	11.686	12.200	0.361	11.300	11.786	12.240	0.327		11.220	11.719	12.170	0.329	PASSED
3	11.180	11.657	12.360	0.344	11.270	11.732	12.320	0.331		11.210	11.659	12.240	0.324	

044103.5WR - Resistance to Solvents													
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	10.850	11.730	13.670	0.845	10.930	11.832	13.610	0.803	42:1:1 mixture by volume of water to propylene glycol monomethylether to monoethanolamine	10.860	11.754	13.520	0.790	
2	11.280	11.982	12.840	0.537	11.290	12.069	12.890	0.518		11.230	12.003	12.830	0.517	PASSED
3	11.240	11.885	13.370	0.635	11.340	11.925	13.500	0.653		11.280	11.874	13.450	0.654	

0441006.WR- Resistance to Solvents													
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.600	6.783	6.970	0.126	6.911	7.156	7.309	0.154	1:3 Mixture by volume of isopropyl alcohol to mineral spirits	6.939	7.183	7.338	0.153	
2	6.720	6.859	6.980	0.090	7.039	7.186	7.365	0.094		7.064	7.212	7.386	0.093	PASSED
3	6.850	7.268	7.680	0.296	7.141	7.578	7.974	0.288		7.157	7.600	7.995	0.289	

0441006.WR- Resistance to Solvents													
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.650	6.822	6.930	0.094	6.981	7.182	7.356	0.109	EC-7R (Bioact)	7.013	7.215	7.387	0.108	
2	6.760	6.865	6.980	0.082	7.091	7.190	7.247	0.059		7.122	7.219	7.281	0.060	PASSED
3	6.810	7.265	8.160	0.425	7.165	7.594	8.427	0.409		7.174	7.607	8.440	0.410	

0441006.WR- Resistance to Solvents													
Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.520	6.815	6.970	0.136	6.923	7.167	7.302	0.129	42:1:1 mixture by volume of water to propylene glycol monomethylether to monoethanolamine	6.955	7.199	7.334	0.130	
2	6.730	6.886	6.990	0.093	7.073	7.197	7.337	0.097		7.095	7.221	7.360	0.098	PASSED
3	6.700	7.250	7.810	0.386	7.124	7.594	8.266	0.377		7.120	7.592	8.268	0.380	

6. MECHANICAL SHOCK - 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 213
Test Condition: 50 g's, 11msec duration, Half-sine, 6 shock pulses in 3 planes
Post resistance measurement
Examine visually after test
Results: All fuses passed successfully.

0441002.WR - Mechanical Shock

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	28.950	31.236	37.210	1.894	28.820	31.029	37.140	1.896	28.740	31.008	37.120	1.897	PASSED
2	28.900	31.148	34.540	1.544	29.120	31.413	34.770	1.523	29.110	31.410	34.770	1.519	PASSED
3	27.560	30.121	32.840	1.511	27.610	30.344	33.170	1.510	27.610	30.350	33.170	1.510	PASSED

0441002.WR - Mechanical Shock Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	28.810	31.095	36.880	1.926	PASSED	7A	0.060	0.097	0.140	0.021	PASSED
2		29.660	31.683	34.740	1.613	PASSED		0.068	0.094	0.112	0.014	PASSED
3		28.060	30.440	33.280	1.765	PASSED		0.090	0.113	0.213	0.032	PASSED

044103.5WR - Mechanical Shock

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	10.570	11.640	13.760	0.604	10.590	11.710	13.830	0.598	10.580	11.679	13.790	0.597	PASSED
2	10.830	11.742	12.400	0.380	10.830	11.753	12.320	0.391	10.800	11.729	12.290	0.388	PASSED
3	10.840	11.736	12.530	0.434	10.820	11.700	12.520	0.414	10.810	11.697	12.500	0.413	PASSED

044103.5WR - Mechanical Shock Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	10.640	11.718	13.830	0.742	PASSED	12.25A	0.453	0.788	1.178	0.202	PASSED
2		10.820	11.748	12.350	0.440	PASSED		0.186	0.715	1.268	0.257	PASSED
3		10.990	11.767	12.530	0.413	PASSED		0.447	0.644	0.988	0.156	PASSED

0441006.WR - Mechanical Shock

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.700	7.133	7.940	0.257	7.125	7.501	8.029	0.229	7.156	7.502	8.007	0.218	PASSED
2	6.420	7.074	7.740	0.307	6.688	7.405	8.110	0.317	6.689	7.397	8.080	0.318	PASSED
3	6.690	7.100	7.730	0.303	6.963	7.439	8.070	0.314	6.939	7.423	8.055	0.314	PASSED

0441006.WR - Mechanical Shock Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	7.188	7.543	8.010	0.254	PASSED	21A	0.130	0.149	0.166	0.011	PASSED
2		6.693	7.407	8.013	0.361	PASSED		0.114	0.163	0.197	0.024	PASSED
3		7.103	7.440	8.060	0.299	PASSED		0.123	0.161	0.220	0.027	PASSED

7. MOISTURE SENSITIVITY LEVEL/RESISTANCE TO SOLDERING HEAT -30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: JEDEC J-STD020D
Test Condition: Perform 24-hr baking at 125C.
MSL 1: 85C/85%RH 168hrs.
Subject the samples to 3 times reflow.
Results: All fuses passed successfully.

0441002.WR - Moisture Sensitivity Level

Lot No.	Initial Loose Resistance mΩ				Test Condition	Post Resistance mΩ				1st Reflow mΩ				2nd Reflow mΩ				3rd Reflow mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	28.650	30.398	32.770	1.089	MSL 1	28.940	30.596	32.790	1.066	28.800	30.537	32.830	1.096	28.880	30.560	32.870	1.095	28.930	30.636	33.020	1.108	PASSED
2	29.200	31.280	33.390	1.082		29.410	31.446	33.940	1.129	29.330	31.431	33.650	1.079	29.330	31.445	33.640	1.069	29.330	31.473	33.690	1.080	PASSED
3	27.390	30.471	32.980	1.604		27.220	30.712	33.090	1.662	27.260	30.622	33.190	1.663	27.310	30.659	33.270	1.671	27.360	30.700	33.500	1.681	PASSED

0441002.WR - Moisture Sensitivity Level Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	29.1600	30.8127	32.6900	1.2116	PASSED	7A	0.0824	0.1103	0.1382	0.0200	PASSED
2		29.5400	31.2607	32.9000	1.1232	PASSED		0.0721	0.0964	0.1495	0.0227	PASSED
3		28.0500	30.9267	33.4900	1.5081	PASSED		0.0732	0.1264	0.2155	0.0392	PASSED

044103.5WR - Moisture Sensitivity Level

Lot No.	Initial Loose Resistance mΩ				Test Condition	Post Resistance mΩ				1st Reflow mΩ				2nd Reflow mΩ				3rd Reflow mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	10.980	11.662	12.560	0.463	MSL 1	10.790	11.583	12.400	0.448	11.030	11.826	12.810	0.495	11.000	11.786	12.800	0.495	11.010	11.839	12.860	0.502	PASSED
2	10.560	11.755	13.490	0.652		10.540	11.728	13.450	0.650	11.020	11.891	13.410	0.578	10.980	11.881	13.430	0.582	11.010	11.908	13.460	0.582	PASSED
3	10.850	11.771	12.770	0.510		10.750	11.619	12.620	0.516	10.890	11.856	13.580	0.582	10.880	11.867	13.610	0.601	10.910	11.893	13.630	0.602	PASSED

441GT 3.5A Validation Test Environmental - Moisture Sensitivity Level

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	11.0800	11.6380	12.4400	0.3500	PASSED	12.25A	0.4093	0.6943	1.3410	0.2677	PASSED
2		11.0200	12.0640	13.4500	0.6415	PASSED		0.3040	0.7518	1.3680	0.2855	PASSED
3		10.9300	11.8687	13.0400	0.5482	PASSED		0.4022	0.8034	1.5290	0.3259	PASSED

0441006.WR - Moisture Sensitivity Level

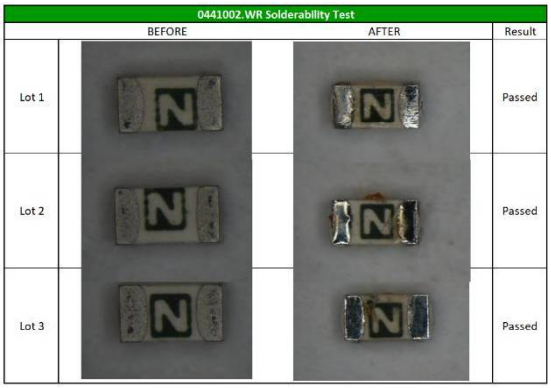
Lot No.	Initial Loose Resistance mΩ				Test Condition	Post Resistance mΩ				1st Reflow mΩ				2nd Reflow mΩ				3rd Reflow mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.480	6.826	6.990	0.120	MSL 1	6.562	6.912	7.497	0.172	6.826	7.193	7.395	0.135	6.836	7.206	7.402	0.135	6.824	7.196	7.395	0.136	PASSED
2	6.040	6.837	6.980	0.175		6.154	6.955	7.210	0.195	6.421	7.215	7.412	0.178	6.449	7.234	7.421	0.177	6.440	7.223	7.415	0.177	PASSED
3	6.070	6.770	6.997	0.336		6.181	6.809	7.344	0.329	6.611	7.109	7.613	0.341	6.613	7.125	7.628	0.342	6.712	7.123	7.621	0.341	PASSED

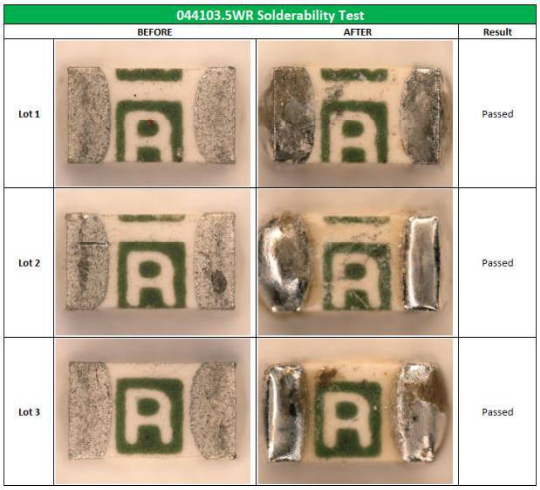
0441006.WR - Moisture Sensitivity Level Post Test

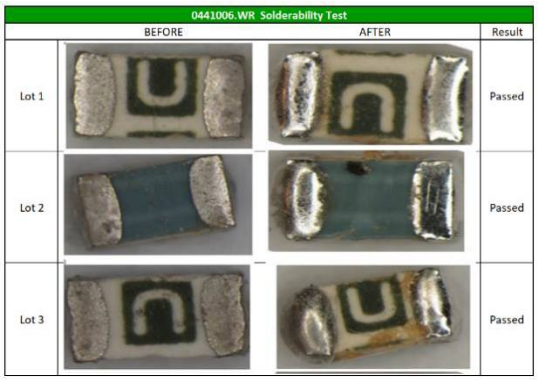
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	6.9000	7.1337	7.2640	0.1129	PASSED	21A	0.1451	0.1808	0.2212	0.0209	PASSED
2		6.3800	7.1373	7.3280	0.2315	PASSED		0.1602	0.1771	0.1994	0.0115	PASSED
3		6.7580	7.0580	7.4851	0.3495	PASSED		0.1105	0.1455	0.1837	0.0246	PASSED

8. SOLDERABILITY -30 fuses per lot

Criteria: Fuses shall exhibit 95% solder coverage
Test Reference: IPC/EIA/JEDEC J-STD-002D
Test Condition: Steam age fuses for 8 hours
Immerse fuse terminations in 245°C ± 5°C solder for 5seconds ± 0.5second. Maintain an immersion and emersion rate of 25mm/s ± 6mm/s.
Examine visually after test
Results: All fuses passed successfully.







9. TERMINAL STRENGTH -30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: IEC-60127-4
Test Condition: Apply a force that will bend the board a minimum distance of x=2mm.
Apply the force once for 60 sec.
Post Resistance Measurement
Examine visually after test
Results: All fuses passed successfully

0441002.WR - Terminal Strength

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	29.180	30.965	35.450	1.278	29.250	31.041	35.530	1.281	29.340	31.114	35.610	1.283	PASSED
2	25.770	30.624	33.670	1.603	25.860	30.690	33.720	1.601	25.940	30.757	33.790	1.601	PASSED
3	27.780	30.714	34.180	1.754	27.850	30.777	34.220	1.747	27.920	30.838	34.260	1.745	PASSED

0441002.WR - Terminal Strength Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	29.800	31.350	35.640	1.465	PASSED	7A	0.083	0.330	0.998	0.402	PASSED
2		28.700	31.351	33.830	1.372	PASSED		0.087	0.114	0.321	0.058	PASSED
3		27.980	30.803	34.300	1.992	PASSED		0.087	0.099	0.112	0.009	PASSED

044103.5WR - Terminal Strength

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	10.580	11.729	13.520	0.552	10.620	11.857	13.860	0.607	10.710	11.929	13.940	0.607	PASSED
2	10.610	11.769	13.050	0.556	10.840	11.942	13.150	0.534	10.870	11.985	13.190	0.536	PASSED
3	11.080	11.889	13.930	0.522	11.280	12.057	14.460	0.575	11.310	12.101	14.490	0.574	PASSED

044103.5WR - Terminal Strength Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	10.750	12.094	13.970	0.766	PASSED	12.25A	0.675	0.847	1.023	0.124	PASSED
2		11.330	12.029	13.110	0.515	PASSED		0.582	0.813	1.221	0.158	PASSED
3		11.330	12.133	14.510	0.764	PASSED		0.586	0.758	1.022	0.154	PASSED

0441006.WR - Terminal Strength

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.590	7.042	7.600	0.313	7.146	7.645	8.182	0.324	7.148	7.648	8.185	0.324	PASSED
2	6.670	7.042	7.620	0.224	7.093	7.601	8.288	0.248	7.093	7.601	8.288	0.248	PASSED
3	6.760	7.207	7.940	0.306	7.348	7.753	8.486	0.298	7.348	7.753	8.486	0.298	PASSED

0441006.WR - Terminal Strength Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	7.155	7.725	8.188	0.320	PASSED	21A	0.107	0.232	1.560	0.368	PASSED
2		7.345	7.589	8.001	0.198	PASSED		0.101	0.123	0.146	0.015	PASSED
3		7.364	7.723	8.496	0.312	PASSED		0.103	0.133	0.168	0.016	PASSED

10. LOW FREQUENCY VIBRATION TEST- 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 201
Test Condition: Vibration amplitude is to be 0.06 inches (0.12 inch total excursion) unless otherwise specified. Frequency sweep is to be 10 Hz to 55 and back to 10 Hz in one minute. Fuses are to be tested under these conditions for two (2) hours in each plane for a total of six (6) hours.
Examine visually after test
Results: All fuses passed successfully

0441002.WR - Low Frequency Vibration

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	27.070	30.183	33.820	1.538	27.380	30.646	34.160	1.518	27.120	30.672	33.910	1.536	PASSED
2	28.440	30.381	32.170	0.835	28.800	30.801	32.720	0.840	28.540	30.512	32.430	0.833	PASSED
3	27.430	30.177	33.230	1.412	27.830	30.555	33.520	1.414	27.620	30.316	33.270	1.403	PASSED

0441002.WR - Low Frequency Vibration Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	28.910	30.966	33.340	1.312	PASSED	7A	0.068	0.283	0.998	0.352	PASSED
2		29.770	30.480	31.760	0.549	PASSED		0.089	0.101	0.121	0.009	PASSED
3		27.680	29.961	32.700	1.366	PASSED		0.070	0.098	0.121	0.013	PASSED

044103.5WR - Low Frequency Vibration

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	10.750	11.579	13.070	0.499	10.810	11.604	13.200	0.494	10.770	11.571	13.160	0.494	PASSED
2	10.770	11.902	12.980	0.476	10.900	11.942	13.060	0.469	10.890	11.915	13.030	0.466	PASSED
3	11.150	11.919	13.520	0.496	11.010	11.865	13.670	0.517	11.010	11.858	13.660	0.515	PASSED

044103.5WR - Low Frequency Vibration Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	11.070	11.590	12.360	0.408	PASSED	12.25A	0.431	0.839	1.509	0.264	PASSED
2		11.190	11.969	13.050	0.507	PASSED		0.396	0.640	1.183	0.221	PASSED
3		11.060	11.979	13.720	0.633	PASSED		0.431	0.822	1.521	0.256	PASSED

0441006.WR- Low Frequency Vibration

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.670	7.117	7.810	0.338	7.059	7.538	8.191	0.348	7.087	7.556	8.221	0.348	PASSED
2	6.600	6.987	7.510	0.216	6.943	7.413	7.790	0.240	6.964	7.429	7.816	0.243	PASSED
3	6.350	7.133	7.860	0.336	6.721	7.475	8.287	0.331	6.739	7.489	8.297	0.330	PASSED

0441006.WR- Low Frequency Vibration Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	6.698	7.505	8.257	0.386	PASSED	21A	0.107	0.148	0.182	0.024	PASSED
2		7.029	7.454	8.150	0.350	PASSED		0.121	0.165	0.196	0.019	PASSED
3		7.068	7.373	7.764	0.218	PASSED		0.123	0.159	0.226	0.030	PASSED

11. HIGH FREQUENCY VIBRATION TEST - 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 204
Test Condition: Perform Test Condition D (20 G peak acceleration, 10-2000-10 Hz sweep in 20 minutes, 12 sweeps per plane), unless otherwise specified.
Examine visually after test
Results: All fuses passed successfully

0441002.WR - High Frequency Vibration

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	28.670	30.680	33.730	1.177	29.100	31.252	34.230	1.177	28.820	30.932	33.880	1.165	PASSED
2	25.320	30.550	35.180	1.686	25.680	30.985	35.670	1.698	25.420	30.679	35.330	1.679	PASSED
3	28.040	30.297	33.340	1.394	28.320	30.700	33.810	1.389	28.130	30.460	33.540	1.382	PASSED

0441002.WR - High Frequency Vibration Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	29.570	31.168	33.960	1.229	PASSED	7A	0.085	0.100	0.121	0.010	PASSED
2		29.260	30.658	32.230	0.921	PASSED		0.068	0.449	0.987	0.417	PASSED
3		28.280	30.653	33.600	1.527	PASSED		0.103	0.734	0.995	0.392	PASSED

044103.5WR - High Frequency Vibration

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	10.960	11.709	12.550	0.439	11.170	11.779	12.510	0.429	11.130	11.736	12.460	0.428	PASSED
2	10.730	11.820	12.640	0.523	10.770	11.806	12.710	0.511	10.730	11.761	12.650	0.507	PASSED
3	10.460	11.834	13.150	0.616	10.640	11.792	13.170	0.617	10.630	11.783	13.140	0.616	PASSED

044103.5WR - High Frequency Vibration Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	11.160	11.695	12.490	0.466	PASSED	12.25A	0.454	0.693	1.054	0.175	PASSED
2		11.160	11.785	12.670	0.479	PASSED		0.278	0.715	1.394	0.303	PASSED
3		10.660	11.805	13.200	0.745	PASSED		0.406	0.724	1.101	0.211	PASSED

0441006.WR - High Frequency Vibration

Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	5.040	7.046	7.640	0.465	7.105	7.541	7.941	0.256	7.122	7.559	7.958	0.257	PASSED
2	6.600	7.048	7.710	0.245	7.005	7.451	8.132	0.246	7.036	7.482	8.175	0.248	PASSED
3	6.660	7.196	8.070	0.349	7.030	7.558	8.437	0.344	7.064	7.594	8.482	0.345	PASSED

0441006.WR - High Frequency Vibration Post Test

Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	7.074	7.501	7.912	0.260	PASSED	21A	0.119	0.149	0.171	0.018	PASSED
2		7.205	7.449	7.820	0.205	PASSED		0.125	0.162	0.202	0.021	PASSED
3		7.119	7.527	8.130	0.315	PASSED		0.098	0.150	0.200	0.026	PASSED

12. MOISTURE RESISTANCE - 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 106G
Test Condition: Perform pre-conditioning at 50C for 24 hours.
Subject fuses to 10 continuous cycles with profile as per MIL STD202 106G.
Examine visually after test
Results: All fuses passed successfully

0441002.WR - Moisture Resistance														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	28.070	30.534	33.770	1.174	28.070	30.535	33.520	1.105	as per MIL-STD 202 106G	28.170	30.667	33.780	1.141	PASSED
2	28.110	30.969	34.750	1.205	28.150	30.896	34.530	1.185		28.230	30.988	34.650	1.192	PASSED
3	26.880	30.416	36.970	2.299	26.860	30.516	36.960	2.277		26.930	30.585	37.000	2.275	PASSED

0441002.WR - Moisture Resistance Post Test													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (2A)	27.960	30.820	33.560	1.343	PASSED	7A	0.077	0.119	0.152	0.021	PASSED
2		29.770	31.167	34.590	1.217	PASSED		0.055	0.112	0.195	0.031	PASSED
3		27.850	30.280	33.790	1.436	PASSED		0.060	0.134	0.283	0.056	PASSED

044103.5WR - Moisture Resistance														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	10.620	11.578	12.180	0.340	10.980	11.720	12.290	0.318	as per MIL-STD 202 106G	10.790	11.520	12.080	0.315	PASSED
2	11.070	11.907	12.540	0.393	11.120	12.042	12.850	0.407		10.920	11.829	12.620	0.400	PASSED
3	10.870	11.704	12.490	0.410	10.980	11.772	12.610	0.418		10.810	11.597	12.430	0.415	PASSED

441GT 3.5A Validation Test Environmental - Moisture Resistance													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (3.5A)	10.880	11.665	12.180	0.335	PASSED	12.25A	0.627	0.940	1.401	0.241	PASSED
2		11.600	12.014	12.450	0.302	PASSED		0.459	0.808	1.546	0.258	PASSED
3		11.060	11.736	12.540	0.454	PASSED		0.515	0.854	1.370	0.231	PASSED

441GT 6A Validation Test Environmental - Moisture Resistance														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.360	6.771	6.950	0.151	6.770	7.207	7.427	0.150	as per MIL-STD 202 106G	6.740	7.173	7.387	0.149	PASSED
2	6.590	6.843	6.950	0.096	6.972	7.261	7.419	0.112		6.933	7.224	7.383	0.112	PASSED
3	6.420	6.849	6.990	0.123	6.767	7.179	7.346	0.123		6.732	7.153	7.317	0.124	PASSED

0441006.WR - Moisture Resistance Post Test													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (6A)	6.720	7.138	7.320	0.172	PASSED	21A	0.165	0.178	0.207	0.012	PASSED
2		4.289	7.003	7.356	0.762	PASSED		0.154	0.182	0.207	0.013	PASSED
3		6.706	7.132	7.263	0.130	PASSED		0.159	0.183	0.212	0.016	PASSED

13. ELECTRICAL CHARACTERIZATION

Criteria: Fuses shall meet individual part specifications
Test Condition: Subject the fuses to the following tests:

i. Current Carrying Capacity – 30 Fuses per lot

Test Reference: Device specification
Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Condition: 4 hrs at 100% rated current (I_{RAT}), 25ºC
Final device resistance measurement
Results: All fuses passed successfully.

Current Carrying Capacity										
PN	Lot No.	Onboard Resistance mΩ				Post Test Resistance mΩ				Remarks
		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
0441002.WR	1	28.710	30.729	32.690	0.846	28.630	30.686	32.640	0.851	PASSED
	2	29.240	31.179	34.140	1.327	29.250	31.153	34.080	1.319	PASSED
	3	27.650	30.244	33.090	1.462	27.630	30.237	33.100	1.465	PASSED
044102.5WR	1	23.080	23.856	24.500	0.390	23.280	24.285	26.950	0.743	PASSED
	2	22.790	23.741	24.470	0.423	22.770	23.768	24.520	0.436	PASSED
	3	22.280	23.302	24.190	0.474	22.280	23.354	24.260	0.478	PASSED
0441003.WR	1	12.400	12.781	13.230	0.225	12.210	12.606	13.030	0.222	PASSED
	2	12.320	12.728	13.400	0.271	12.150	12.567	13.220	0.268	PASSED
	3	12.240	12.743	13.380	0.306	12.120	12.596	13.230	0.306	PASSED
044103.5WR	1	11.120	11.767	12.790	0.451	11.070	11.724	12.740	0.448	PASSED
	2	11.130	11.907	12.850	0.453	11.100	11.876	12.830	0.458	PASSED
	3	11.000	11.751	12.650	0.387	11.000	11.751	12.650	0.387	PASSED
0441004.WR	1	8.823	9.289	9.696	0.200	8.911	9.388	9.789	0.204	PASSED
	2	9.182	9.487	10.224	0.273	9.282	9.584	10.332	0.275	PASSED
	3	8.825	9.323	9.874	0.218	8.888	9.391	9.940	0.220	PASSED
0441005.WR	1	6.430	7.154	7.500	0.206	6.460	7.181	7.500	0.206	PASSED
	2	6.710	7.238	8.040	0.266	6.740	7.259	8.080	0.269	PASSED
	3	6.810	7.288	7.770	0.190	6.850	7.309	7.780	0.189	PASSED
0441006.WR	1	5.500	5.853	6.300	0.163	5.500	5.903	6.100	0.135	PASSED
	2	5.200	5.847	6.400	0.260	5.400	5.927	6.400	0.202	PASSED
	3	4.700	5.930	6.800	0.428	5.500	5.933	6.400	0.202	PASSED

ii. Overload Test – 30 Fuses per lot

Test Reference: Device specification
Criteria: Fuses shall meet individual part specifications
Test Condition: Conduct overload test at 350%
Fuses shall open before 5 seconds
Results All fuses passed successfully.

Overload Test										
PN	Lot No.	Onboard Resistance mΩ				Opening Time sec				Remarks
		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
0441002.WR	1	27.4800	30.8263	33.9500	1.5895	0.0625	0.0977	0.1385	0.0214	PASSED
	2	28.4800	30.8260	33.3700	1.0124	0.0679	0.1300	0.9218	0.1511	PASSED
	3	27.6600	30.1457	32.9000	1.4685	0.0715	0.1672	0.9176	0.1923	PASSED
044102.5WR	1	23.020	23.834	24.380	0.420	0.050	0.061	0.076	0.008	PASSED
	2	22.750	23.785	24.560	0.522	0.048	0.061	0.083	0.008	PASSED
	3	21.700	23.178	23.980	0.613	0.052	0.069	0.098	0.011	PASSED
0441003.WR	1	12.250	12.732	13.190	0.241	1.270	2.412	3.510	0.605	PASSED
	2	12.290	12.746	13.340	0.298	1.360	2.601	4.750	0.877	PASSED
	3	12.090	12.758	13.380	0.333	1.370	2.554	4.740	0.872	PASSED
044103.5WR	1	10.9400	11.7300	13.8700	0.5721	0.3920	1.0574	2.3400	0.4773	PASSED
	2	11.1800	11.9267	13.3200	0.5382	0.3400	0.8600	1.4800	0.2694	PASSED
	3	10.9800	11.7727	12.6200	0.4667	0.5240	1.1733	2.2300	0.4901	PASSED
0441004.WR	1	8.130	9.225	10.021	0.389	0.561	1.234	4.020	0.856	PASSED
	2	9.173	9.624	10.027	0.223	0.479	0.629	1.051	0.144	PASSED
	3	8.565	9.284	9.681	0.240	0.573	0.849	1.894	0.281	PASSED
0441005.WR	1	6.820	7.204	7.570	0.202	0.398	0.548	0.764	0.096	PASSED
	2	6.830	7.273	7.600	0.217	0.366	0.499	0.674	0.085	PASSED
	3	7.010	7.291	7.560	0.151	0.383	0.539	0.759	0.096	PASSED
0441006.WR	1	6.9820	7.4637	8.3820	0.3429	0.1045	0.1623	0.2044	0.0276	PASSED
	2	6.8590	7.4657	8.1380	0.3109	0.1130	0.1648	0.2421	0.0287	PASSED
	3	7.0720	7.4689	7.9820	0.2252	0.1233	0.1565	0.1890	0.0179	PASSED

iii. Short Circuit Interrupting Ability – 30 Fuses per lot

Test Reference: Device specification
Criteria: Fuses shall meet individual part specifications
Test Condition: Fuses shall be subjected to tests at the voltages (s); current (s); power factors (AC) and time constants (DC) specified in the fuse specification sheet.
Results: All fuses passed successfully.

Short Circuit Test							
PN	Lot No.	Onboard Resistance mΩ				Test Condition	Remarks
		Min.	Ave.	Max.	Stdev.		
0441002.WR	1	28.5700	30.8770	33.8600	1.2640	50A 32VDC	PASSED
	2	29.2900	31.0160	35.3000	1.3978		PASSED
	3	26.6900	30.3513	33.8500	1.9135		PASSED
044102.5WR	1	22.300	23.543	24.200	0.461		PASSED
	2	22.600	23.637	24.300	0.425		PASSED
	3	22.800	23.630	24.400	0.440		PASSED
0441003.WR	1	12.020	12.450	13.000	0.273		PASSED
	2	12.200	12.577	13.100	0.332		PASSED
	3	12.301	12.477	13.000	0.267		PASSED
044103.5WR	1	10.9800	11.7893	13.3900	0.5138		PASSED
	2	10.6400	11.8677	13.3300	0.5951		PASSED
	3	10.9300	11.7293	12.4800	0.4693		PASSED
0441004.WR	1	7.500	8.863	9.600	0.453		PASSED
	2	7.900	9.203	10.100	0.425		PASSED
	3	8.400	9.360	9.900	0.341		PASSED
0441005.WR	1	6.300	6.803	7.500	0.254		PASSED
	2	6.500	7.147	7.900	0.338		PASSED
	3	6.500	7.253	7.900	0.289		PASSED
0441006.WR	1	5.3200	5.5727	5.8600	0.1496		PASSED
	2	5.1100	5.4713	5.8000	0.1612		PASSED
	3	5.3200	5.5673	5.9400	0.1604		PASSED

-End of Document-

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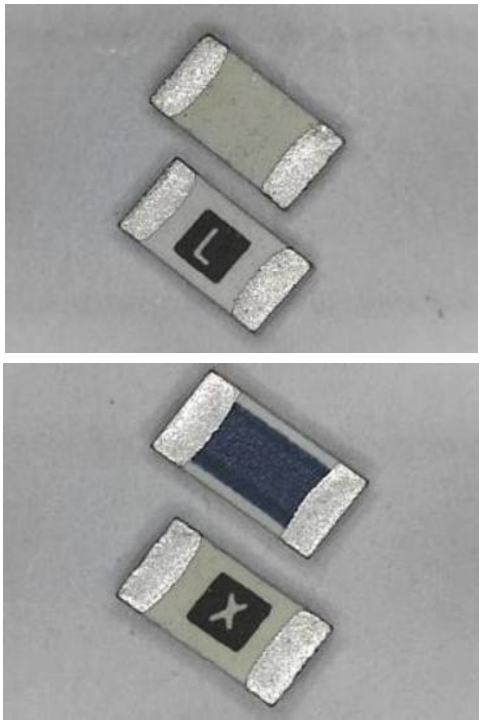
January 11, 2023

Validation Test Report for 440 Series Ceramic Chip Fuse



Part Number
04401.75 WR
0440002. WR
044002. 5WR
0440003. WR
044003. 5WR
0440004. WR
0440005. WR
0440007. WR
0440008. WR

This document is a summary of tests and results to validate the conformance of 440 Series (1.75A – 8A) Ceramic Chip fuses to Validation Test Requirements

Section 1 – INTRODUCTION

1.1. Key Objective

To validate the conformance of 440 Ceramic Chip Fuse (CCF) series to Validation Test stress test requirements and verify its suitability to automotive applications. The ratings tested for full validation tests include the lowest and highest rating of 440 Series: 1.75A and 8A. The results of the full validation tests will represent all other ratings of the 440 series.

1.2. Agency Approvals

UL recognized (cURus)
Certified by the Canadian Standards Association (CSA)

1.3. Sample Preparation

All samples (unless specified otherwise in succeeding sections of this report) underwent:

1. Loose resistance measurement using Tegam® meter and four-point probe.
2. Mounting onto appropriate10-position test boards with one time exposure to reflow profile (*Fig.1)*, having a peak temperature of 261.6 °C at the board surface. Fuses were mounted using Kester Easy Profile 256LF (96.5Sn/3.0Ag/0.5Cu) lead-free solder paste.

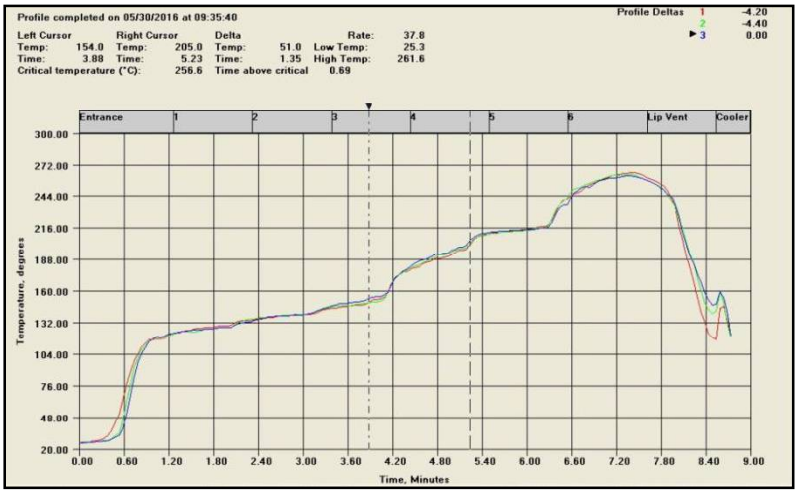


Figure 1. Lead-Free Reflow Oven Profile

3. One hour cooling at room ambient temperature.
4. On-board resistance measurement after reflow.
   4.1. Specifically, tests under electrical characterization tests (*Resistance at 3 temp, Life Test, Overload Test and Short Circuit Interrupting Ability*) were done at room temp and the fuse minimum and maximum operating temperatures specified on its data sheet (-55ºC, 25ºC, and 150ºC). For the 0704002.WRA, the environmental tests were done at 125C (*High Temp Storage*, *Operational Life* and *Thermal Shock).*

1.4. Post Tests

To prove compliance, all tests except electrical characterization tests underwent post Life Test for four (4) hours and Overload Test at 250% and 350% of fuse rated current.

1.5. Product Specifications

Resistance/Voltage Drop/Interrupting Rating

Part Number	Nominal Resistance (Ω)	Nominal Voltage Drop @ Rated Current (V)	Interrupting Rating (AC/DC)
04401.75WR	0.045	0.0777	50 A @ 32 VAC/DC
0440002.WR	0.0385	0.0792	50 A @ 32 VAC/DC
044002.5WR	0.0285	0.0747	50 A @ 32 VAC/DC
0440003.WR	0.02252	0.0742	50 A @ 32 VAC/DC
044003.5WR	0.01845	0.0757	50 A @ 32 VAC/DC
0440004.WR	0.01553	0.0709	50 A @ 32 VAC/DC
0440005.WR	0.012	0.0654	50 A @ 32 VAC/DC
0440007.WR	0.00753	0.0696	50 A @ 32 VAC/DC
0440008.WR	0.00634	0.0655	50 A @ 32 VAC/DC

Electrical Characteristics

% Overload	Ampere Rating	Opening Time (Sec)
100%	1.75A – 8A	4 Hours Minimum
350%	1.75A – 8A	5 Sec Maximum

Section 2 – TESTS AND RESULTS

1. **THERMAL SHOCK TEST –** 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202, Method 107, Condition B
Test Condition: Subject fuses to 100 temperature cycles
15 min. at –55°C lowest temp and 15 min. at 150°C highest temp
Post resistance measurement.
Results: All fuses passed successfully.

04401.75WR Thermal Shock														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	38.560	39.364	41.300	0.761	38.560	39.364	41.300	0.761	100 Cycles Thermal Shock	38.090	38.974	41.110	0.773	PASSED
2	38.130	38.758	40.550	1.679	38.570	39.286	40.480	0.575		38.100	38.840	40.110	0.571	PASSED
3	38.190	39.066	41.520	1.093	38.460	39.520	41.380	0.821		38.050	39.307	41.090	0.823	PASSED

Post Test											
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	38.480	39.115	40.850	0.711	PASSED	6.125A	1.585	2.409	2.956	0.429	PASSED
2		38.180	38.870	40.090	0.628	PASSED		1.714	2.358	2.934	0.332	PASSED
3		37.970	38.947	39.920	0.602	PASSED		1.632	2.357	3.050	0.491	PASSED

0440008.WR - Thermal Shock														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.390	6.995	7.500	0.326	6.440	7.032	7.560	0.322	100 Cycles Thermal Shock	6.453	7.045	7.561	0.321	PASSED
2	6.400	7.150	7.810	0.349	6.380	7.144	7.890	0.370		6.395	7.192	7.908	0.361	PASSED
3	6.420	7.024	7.780	0.325	6.500	7.081	7.820	0.335		6.528	7.102	7.852	0.334	PASSED

0440008.WR - Thermal Shock Post Test											
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.530	7.010	7.420	0.280	PASSED	28A	0.162	0.239	0.348	0.062	PASSED
2		6.363	7.104	7.580	0.338	PASSED		0.131	0.202	0.307	0.052	PASSED
3		6.483	6.994	7.522	0.286	PASSED		0.142	0.215	0.300	0.047	PASSED

2. BIASED HUMIDITY – 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: JESD22 - A110-B
Test Condition: Subject fuses to 85°C/85% RH with 10% operating current for 1000 hrs.
Measure fuse resistance at 168hrs and 336hrs.
Examine visually after test
Post resistance measurement
Results: All fuses passed successfully.

04401.75WR Biased Humidity										
Lot No.	Initial Loose Resistance mΩ				Test Condition	Onboard Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	38.040	38.563	39.860	0.517	Apply .175A @ 85oC/85%RH for 1000hrs.	38.140	38.673	39.970	0.523	PASSED
2	38.000	38.614	40.080	0.560		38.080	38.688	40.360	0.596	PASSED
3	38.230	38.903	40.190	0.583		38.300	39.017	40.320	0.575	PASSED

04401.75WR - Biased Humidity Post Test											
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	38.250	38.868	40.380	0.685	PASSED	6.125A	1.436	2.266	3.160	0.463	PASSED
2		38.240	38.795	40.310	0.556	PASSED		1.562	2.042	2.620	0.273	PASSED
3		38.540	39.061	40.320	0.485	PASSED		1.624	2.128	2.803	0.360	PASSED

0440008.WR Biased Humidity										
Lot No.	Initial Loose Resistance mΩ				Test Condition	Onboard Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.410	6.981	7.710	0.378	Apply .800A @ 85oC/85%RH for 1000hrs.	6.470	7.052	7.830	0.387	PASSED
2	6.430	7.117	7.640	0.296		6.510	7.190	7.700	0.297	PASSED
3	6.370	7.045	7.730	0.338		6.440	7.138	7.720	0.336	PASSED

0440008.WR - Biased Humidity Post Test											
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.420	7.069	7.750	0.368	PASSED	28A	0.094	0.162	0.215	0.040	PASSED
2		5.840	7.057	7.630	0.431	PASSED		0.078	0.116	0.187	0.034	PASSED
3		6.670	7.114	7.670	0.322	PASSED		0.133	0.185	0.288	0.043	PASSED

3. HIGH TEMPERATURE OPERATIONAL LIFE – 30 fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 108, Test Condition D
Test Condition: Place fuses in a chamber at 150°C for 1000hrs
Apply de-rated current: (Fuse Rating) x (% Temp de-rating) x 75% (Standard de-rating)
Measure fuses resistance at 168hrs and 336hrs
Examine visually after the test
Post resistance measurement
Results: All fuses passed successfully.

04401.75WR High Temperature Operational Life																				
Lot No.	Initial Loose Resistance				Onboard Resistance				Onboard Resistance @ 168Hrs				Onboard Resistance @ 336Hrs				Onboard Resistance @ 1000Hrs				Visual Examination
	mΩ				mΩ				mΩ				mΩ				mΩ				
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.543	39.969	41.104	0.674	38.314	40.259	41.940	1.004	38.650	39.902	41.056	0.634	38.306	40.847	43.595	1.450	38.750	40.933	43.839	1.402	PASSED
2	38.359	40.027	41.747	0.815	38.103	39.752	41.333	0.914	39.280	41.529	44.789	1.389	38.984	41.355	44.805	1.335	39.177	40.965	44.701	1.364	PASSED
3	38.249	40.339	42.201	0.816	38.351	39.899	42.084	0.992	38.917	41.164	43.472	1.261	38.159	41.153	43.529	1.265	39.094	40.952	44.531	1.170	PASSED

0440008.WR High Temperature Operational Life																				
Lot No.	Initial Loose Resistance				Onboard Resistance				Onboard Resistance @ 168Hrs				Onboard Resistance @ 336Hrs				Onboard Resistance @ 1000Hrs				Visual Examination
	mΩ				mΩ				mΩ				mΩ				mΩ				
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.310	6.970	7.520	0.358	6.410	7.038	7.540	0.346	6.380	7.021	7.530	0.349	6.430	7.061	7.610	0.354	6.370	6.998	7.500	0.345	PASSED
2	6.090	7.102	7.820	0.366	6.600	7.212	7.870	0.324	6.600	7.184	7.850	0.320	6.600	7.219	7.880	0.324	6.560	7.157	7.820	0.320	PASSED
3	6.460	7.126	7.910	0.354	6.550	7.222	8.010	0.351	6.530	7.213	8.000	0.349	6.540	7.233	8.040	0.353	6.500	7.176	7.950	0.349	PASSED

4. PHYSICAL DIMENSION – 30 fuses per lot

Criteria: The fuses shall meet individual part specifications
Test Reference: JESD22 Method JB-100
Test Condition: Verify physical dimensions of fuses.
Results: All fuses passed successfully.

SPECIFICATIONS					
FUSE LENGTH		FUSE WIDTH		FUSE THICKNESS	
Min	Max	Min	Max	Min	Max
3.022	3.378	1.430	1.730	0.685	0.985

Physical Dimension														
PN	Lot No.	Fuse Length				Fuse Width				Fuse Thickness				Test Result
		mm				mm				mm				
		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
04401.75WR	1	3.180	3.205	3.239	0.016	1.633	1.674	1.730	0.021	0.776	0.804	0.833	0.016	PASSED
	2	3.144	3.175	3.234	0.020	1.579	1.655	1.712	0.023	0.784	0.822	0.856	0.018	PASSED
	3	3.127	3.173	3.212	0.017	1.631	1.652	1.685	0.010	0.756	0.819	0.854	0.025	PASSED
0440008.WR	1	3.155	3.174	3.192	0.010	1.599	1.640	1.700	0.020	0.783	0.811	0.867	0.017	PASSED
	2	3.104	3.176	3.223	0.020	1.539	1.626	1.730	0.054	0.776	0.800	0.830	0.014	PASSED
	3	3.150	3.193	3.220	0.014	1.629	1.651	1.686	0.011	0.838	0.860	0.895	0.014	PASSED

5. RESISTANCE TO SOLVENTS – 30 Fuses per lot

Criteria: Visual Examination
Fuses shall exhibit no physical, mechanical or electrical damage.

Test Reference: MIL-STD-202 Method 215K

Test Condition: a.) 1:3 Mixture by volume of isopropyl alcohol to mineral spirits
b.) EC-7R (Bioact)
c.) 42:1:1 mixture by volume of water to propylene glycol monomethylether to monoethanolamine
Examine visually after the test
Post resistance measurement

Results: All fuses passed successfully.

04401.75A - Resistance to Solvents

Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	38.184	39.698	41.323	0.820	38.205	39.686	41.189	0.832	1:3 Mixture by volume of isopropyl alcohol to mineral spirits	38.680	39.710	41.969	0.647	PASSED
2	38.290	39.820	41.483	0.814	38.212	39.671	41.311	0.789		38.211	39.795	40.993	0.764	
3	38.680	39.793	41.386	0.637	38.241	39.648	41.288	0.704		38.026	39.529	41.096	0.715	

04401.75A - Resistance to Solvents

Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	38.234	39.612	40.801	0.686	38.047	39.718	41.128	0.754	EC-7R (Bioact)	38.000	39.902	41.622	0.853	PASSED
2	38.660	39.782	41.510	0.743	38.058	39.638	41.404	0.859		38.229	39.690	41.933	0.827	
3	38.107	39.772	41.228	0.791	38.479	39.803	41.214	0.666		38.052	39.911	42.429	0.903	

04401.75A - Resistance to Solvents

Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	38.548	40.036	41.322	0.657	38.572	40.015	41.664	0.716	42:1:1 mixture by volume of water to propylene glycol monomethylether to monoethanolamine	38.814	40.006	41.333	0.765	PASSED
2	38.442	39.967	41.344	0.762	38.559	40.032	41.679	0.784		38.745	40.337	42.365	0.760	
3	38.547	39.919	41.731	0.840	38.387	39.901	41.635	0.842		38.709	40.086	41.376	0.669	

04401.75A - Resistance to Solvents

Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	38.555	40.013	41.191	0.749	38.513	40.170	41.158	0.668	Isopropyl alcohol	38.485	39.918	41.416	0.747	PASSED
2	38.366	39.759	40.808	0.589	38.110	39.984	42.099	0.838		38.073	40.082	41.520	0.865	
3	38.283	40.048	41.891	0.850	38.416	39.815	41.296	0.720		38.492	39.985	42.086	0.935	

0440008.WR Resistance to Solvents

Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.320	6.888	7.190	0.293	6.410	6.953	7.260	0.289	1:3 Mixture by volume of isopropyl alcohol to mineral spirits	6.430	6.969	7.260	0.285	PASSED
2	6.640	7.151	7.760	0.378	6.700	7.213	7.840	0.372		6.710	7.237	7.870	0.375	
3	6.500	6.973	7.760	0.392	6.590	7.033	7.740	0.360		6.600	7.052	7.760	0.365	

0440008.WR Resistance to Solvents

Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.530	7.118	7.430	0.254	6.680	7.240	7.550	0.246	EC-7R (Bioact)	6.710	7.266	7.570	0.243	PASSED
2	6.110	7.055	7.540	0.456	6.220	7.176	7.680	0.455		6.240	7.198	7.710	0.457	
3	6.640	7.137	7.790	0.325	6.780	7.232	7.860	0.310		6.800	7.251	7.870	0.309	

0440008.WR Resistance to Solvents

Lot No.	Loose Resistance mΩ				Onboard Resistance mΩ				SOLVENT	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.470	6.913	7.380	0.294	6.590	7.025	7.480	0.301	42:1:1 mixture by volume of water to propylene glycol monomethylether to monoethanolamine	6.600	7.046	7.500	0.301	PASSED
2	6.830	7.204	7.790	0.343	6.940	7.283	7.840	0.322		6.960	7.304	7.870	0.322	
3	6.310	6.917	7.480	0.366	6.440	7.022	7.590	0.369		6.450	7.043	7.620	0.374	

6. MECHANICAL SHOCK – 30 Fuses

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 213
Test Condition: 50 g's, 11msec duration, Half-sine, 6 shock pulses in 3 planes
Post resistance measurement
Examine visually after test
Results: All fuses passed successfully.

04401.75A - Mechanical Shock													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.206	38.955	40.060	0.426	38.055	39.030	39.867	0.410	38.067	38.836	39.977	0.459	PASSED
2	38.051	38.884	39.767	0.501	38.208	39.165	39.841	0.434	38.019	39.042	40.584	0.600	PASSED
3	38.027	38.976	40.126	0.483	38.187	39.037	40.208	0.556	38.009	38.962	39.839	0.467	PASSED

04401.75WR - Mechanical Shock Post Test												
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	38.499	39.258	40.716	0.543	PASSED	6.125A	1.957	2.320	2.669	0.220	PASSED
2		38.295	39.016	39.699	0.350	PASSED		1.724	2.110	2.456	0.225	PASSED
3		38.498	38.955	40.591	0.566	PASSED		1.421	2.197	2.751	0.426	PASSED

0440008.WR Mechanical Shock												
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.390	6.909	7.580	0.339	6.462	6.994	7.660	0.345	6.439	6.962	7.627	0.344	PASSED
2	6.510	7.143	7.660	0.327	6.601	7.191	7.770	0.325	6.578	7.164	7.737	0.322	PASSED
3	6.430	7.004	7.750	0.352	6.556	7.089	7.853	0.357	6.528	7.063	7.820	0.356	PASSED

Post Test												
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.457	6.997	7.486	0.344	PASSED	28A	0.175	0.260	0.388	0.067	PASSED
2		6.592	7.265	7.695	0.268	PASSED		0.159	0.247	0.312	0.049	PASSED
3		6.592	7.064	7.529	0.337	PASSED		0.140	0.231	0.321	0.056	PASSED

7. MOISTURE SENSITIVITY LEVEL – 30 Fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: JEDEC J-STD020D
Test Condition: Perform 24-hr baking at 125C.
MSL 1: 85C/85%RH 168hrs.
Subject the samples to 3 times reflow.
Results: All fuses passed successfully.

04401.75WR - Moisture Sensitivity Level																					
Lot No.	Initial Loose Resistance mΩ				Test Condition	Post Resistance mΩ				1st Reflow mΩ				2nd Reflow mΩ				3rd Reflow mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.7140	40.6307	43.2530	1.0167	MSL - 1	38.9780	40.4773	42.1730	0.7887	38.7360	40.6354	42.6620	0.9261	38.5200	40.2794	42.5940	1.0736	38.0790	40.6696	42.4350	0.9305	PASSED
2	38.7400	40.2206	42.0520	0.9558		38.9260	40.6493	42.0750	0.7880	38.5250	40.5277	42.6330	1.0220	38.4180	40.6190	43.5350	1.2035	37.8120	40.4835	42.1730	1.0793	PASSED
3	38.6570	40.5394	42.3160	1.0234		38.8640	40.5319	42.5800	0.9703	38.4620	40.5442	42.8760	1.1395	38.0800	40.3597	42.9300	1.1852	38.5710	40.6771	42.7350	1.0131	PASSED

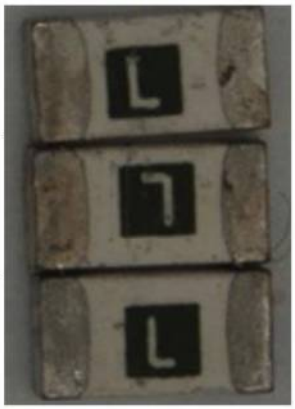
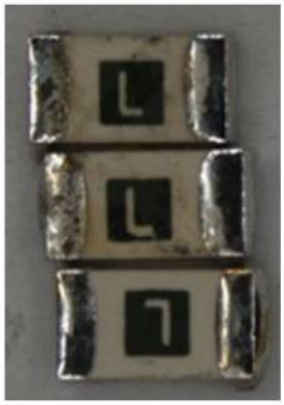
04401.75WR - Moisture Sensitivity Level Post Test										
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	34.7900	37.0913	39.2500	1.2374	PASSED	6.125A	0.6050	1.8383	2.3810	0.4433	PASSED
2		34.9900	37.1667	38.3100	0.9159	PASSED		1.2490	1.9126	2.5850	0.3717	PASSED
3		33.6900	36.9000	40.0900	2.0538	PASSED		1.2290	2.2417	3.0580	0.4637	PASSED

0440008.WR - Moisture Sensitivity Level																						
Lot No.	Initial Loose Resistance mΩ				Test Condition	Post Resistance mΩ				1st Reflow mΩ				2nd Reflow mΩ				3rd Reflow mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.0300	6.8817	7.5000	0.3426	MSL - 1	6.0200	6.8297	7.4000	0.3371	6.1100	6.9623	7.5400	0.3440	6.1300	6.9820	7.5600	0.3433	6.1300	6.9837	7.5600	0.3439	PASSED
2	6.3200	7.0533	7.5700	0.3271		6.2600	6.9950	7.5300	0.3426	6.4700	7.1393	7.7000	0.3209	6.4900	7.1673	7.7400	0.3211	6.4800	7.1603	7.7300	0.3192	PASSED
3	6.1000	6.9583	7.6100	0.2913		6.0400	6.9327	7.6000	0.2941	6.2100	7.0497	7.7000	0.2999	6.2200	7.0663	7.7400	0.3012	6.2200	7.0673	7.7200	0.3013	PASSED

0440008.WR - Moisture Sensitivity Level Post Test										
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.2300	6.8373	7.2300	0.3289	PASSED	28A	0.1560	0.2395	0.4650	0.0730	PASSED
2		6.7200	7.1400	7.6500	0.2853	PASSED		0.1430	0.2111	0.3150	0.0545	PASSED
3		6.1900	7.0147	7.6400	0.3184	PASSED		0.1390	0.2195	0.3060	0.0428	PASSED

8. SOLDERABILITY – 30 fuses per lot

Criteria: Fuses shall exhibit 95% solder coverage
Test Reference: IPC/EIA/JEDEC J-STD-002D
Test Condition: Steam age fuses for 8 hours
Immerse fuse terminations in 245°C ± 5°C solder for 5seconds ± 0.5second. Maintain an immersion and emersion rate of 25mm/s ± 6mm/s.
Examine visually after test
Results: All fuses passed successfully.

04401.75WR Solderability Test			
	Before	After	Result
1			Passed
2			Passed
3			Passed

0440008.WR Solderability Test			
	Before	After	Result
1			Passed
2			Passed
3			Passed

9. TERMINAL STRENGTH – 30 Fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: IEC-60127-4
Test Condition: Apply a force that will bend the board a minimum distance of x=2mm.
Apply the force once for 60 sec.
Post Resistance Measurement
Examine visually after test
Results: All fuses passed successfully

04401.75WR - Terminal Strength													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.9740	40.6546	43.1840	1.0565	38.7060	40.5169	42.1330	0.7990	38.5860	40.5974	42.6100	0.9370	PASSED
2	38.3120	40.2881	41.8400	1.0274	38.2980	40.9360	43.5860	1.1985	37.8840	40.5221	42.4880	1.1036	PASSED
3	38.8210	40.8703	43.1150	1.0389	38.7670	40.4558	43.3560	0.9496	38.9180	40.2161	41.6030	0.8025	PASSED

04401.75WR - Terminal Strength Post Test													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	38.6340	40.3311	41.5340	0.6360	PASSED	6.125A	1.1680	1.5493	1.9190	0.1895	PASSED
2		38.0000	40.2617	42.3600	1.0280	PASSED		1.3000	1.6237	1.7710	0.1275	PASSED
3		39.0820	40.4875	42.9210	1.0352	PASSED		1.1820	1.6599	2.3330	0.3149	PASSED

0440008.WR - Terminal Strength												
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.4700	7.0385	7.5854	0.2935	6.5180	7.0666	7.6050	0.2530	6.5570	7.0363	7.5700	0.2714	PASSED
2	6.5842	7.0464	7.7023	0.2969	6.7460	7.2294	7.6570	0.2489	6.7410	7.2221	7.6360	0.2431	PASSED
3	6.3917	7.0958	7.7154	0.3320	6.4370	7.2647	7.6610	0.2804	6.4220	7.2654	7.6290	0.2777	PASSED

0440008.WR - Terminal Strength Post Test												
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.5710	7.0552	7.5250	0.2975	PASSED	28A	0.2190	0.2735	0.3440	0.0398	PASSED
2		6.6970	7.1174	7.4930	0.2650	PASSED		0.1680	0.2135	0.2870	0.0384	PASSED
3		6.9470	7.3699	7.6680	0.1787	PASSED		0.1730	0.2234	0.3530	0.0504	PASSED

10. LOW FREQUENCY VIBRATION TEST

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 201
Test Condition: Vibration amplitude is to be 0.06 inches (0.12 inch total excursion) unless otherwise specified. Frequency sweep is to be 10 Hz to 55 and back to 10 Hz in one minute. Fuses are to be tested under these conditions for two (2) hours in each plane for a total of six (6) hours.
Examine visually after test
Results: All fuses passed successfully

04401.75WR - Low Frequency Vibration													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.650	39.899	42.023	0.942	38.011	40.121	42.101	0.987	38.285	39.882	41.128	0.659	PASSED
2	38.614	39.891	41.479	0.675	38.665	40.060	41.922	0.912	38.685	39.908	41.083	0.622	PASSED
3	38.545	40.016	42.340	0.819	38.705	40.018	41.371	0.667	38.364	39.923	41.778	0.791	PASSED

04401.75WR - Low Frequency Vibration													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	38.720	40.052	41.709	0.750	PASSED	6.125A	1.452	2.713	2.820	2.294	FAILED
2		38.303	39.963	41.208	0.721	PASSED		1.526	2.560	3.790	0.608	PASSED
3		38.766	40.152	42.237	0.800	PASSED		1.805	2.620	3.360	0.613	PASSED

0440008.WR - Low Frequency Vibration													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.450	6.998	7.410	0.282	6.495	7.052	7.507	0.270	6.495	7.054	7.510	0.272	PASSED
2	6.570	7.080	7.550	0.303	6.617	7.145	7.661	0.304	6.619	7.152	7.676	0.306	PASSED
3	6.350	7.077	7.840	0.377	6.206	7.143	7.918	0.400	6.209	7.143	7.918	0.402	PASSED

0440008.WR - Low Frequency Vibration													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.775	7.112	7.506	0.221	PASSED	28A	0.201	0.261	0.331	0.049	PASSED
2		6.694	7.221	7.665	0.321	PASSED		0.187	0.234	0.314	0.041	PASSED
3		6.185	7.101	7.759	0.470	PASSED		0.142	0.223	0.305	0.044	PASSED

11. HIGH FREQUENCY VIBRATION TEST - 30 Fuses per lot

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 204
Test Condition: Perform Test Condition D (20 G peak acceleration, 10-2000-10 Hz sweep in 20 minutes, 12 sweeps per plane), unless otherwise specified.
Examine visually after test
Results: All fuses passed successfully

04401.75WR - High Frequency Vibration													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.779	40.144	41.730	0.753	38.876	40.194	41.825	0.822	39.101	39.955	41.771	0.669	PASSED
2	38.907	40.055	41.426	0.620	38.799	40.114	41.817	0.661	38.662	40.035	41.455	0.755	PASSED
3	38.574	39.987	41.345	0.777	39.217	40.183	41.558	0.526	38.437	40.072	41.628	0.742	PASSED

04401.75WR - High Frequency Vibration Post Test													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	38.247	39.953	41.642	0.811	PASSED	6.125A	1.327	2.918	3.802	1.125	PASSED
2		38.710	39.847	42.094	0.790	PASSED		1.723	2.451	3.290	0.567	PASSED
3		38.728	40.079	41.649	0.683	PASSED		1.025	2.841	3.630	1.459	PASSED

0440008.WR - High Frequency Vibration													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.300	6.879	7.450	0.313	6.386	6.964	7.567	0.315	6.390	6.960	7.548	0.314	PASSED
2	6.520	7.226	7.870	0.311	6.593	7.262	7.885	0.307	6.604	7.270	7.894	0.306	PASSED
3	6.220	7.028	7.830	0.455	6.279	7.101	7.967	0.462	6.287	7.111	7.996	0.463	PASSED

0440008.WR High Frequency Vibration Post Test													
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.413	6.878	7.319	0.304	PASSED	28A	0.183	0.246	0.312	0.043	PASSED
2		6.623	7.240	7.873	0.315	PASSED		0.151	0.212	0.339	0.044	PASSED
3		6.368	7.168	7.734	0.409	PASSED		0.128	0.250	0.369	0.079	PASSED

12. MOISTURE RESISTANCE

Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Reference: MIL-STD-202 Method 106G
Test Condition: Perform pre-conditioning at 50C for 24 hours.
Subject fuses to 10 continuous cycles with profile as per MIL STD202 106G.
Examine visually after test
Results: All fuses passed successfully

04401.75WR - Moisture Resistance														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	38.353	40.024	41.536	0.752	38.215	39.955	41.707	0.703	MIL-STD-202 Method 106G	38.281	39.805	41.440	0.754	PASSED
2	39.413	40.335	41.803	0.632	38.629	40.064	41.385	0.817		38.912	40.007	41.797	0.594	PASSED
3	38.029	39.834	42.050	0.827	38.398	39.827	41.429	0.706		38.610	39.943	41.306	0.712	PASSED

04401.75WR - Moisture Resistance Post Test												
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (1.75A)	38.102	40.191	41.377	0.832	PASSED	6.125A	0.194	2.584	3.080	1.806	PASSED
2		38.823	39.945	40.940	0.542	PASSED		1.114	2.649	3.280	1.265	PASSED
3		38.102	40.138	41.518	0.707	PASSED		1.992	2.259	2.707	1.592	PASSED

0440008.WR - Moisture Resistance														
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Test Condition	Post Test Resistance mΩ				Visual Examination
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.		Min.	Ave.	Max.	Stdev.	
1	6.360	6.987	7.790	0.402	6.430	7.013	7.650	0.374	MIL-STD-202 Method 106G	6.440	7.043	7.680	0.378	PASSED
2	6.420	7.117	7.750	0.311	6.480	7.149	7.770	0.302		6.490	7.162	7.770	0.303	PASSED
3	6.380	6.860	7.420	0.238	6.480	6.937	7.440	0.233		6.490	6.952	7.460	0.235	PASSED

0440008.WR- Moisture Resistance Post Test												
Lot No.	4-Hr Life Test	Post Life Test Resistance mΩ				Test Results	350% Overload Test	Opening Time secs				Test Results
		Min.	Ave.	Max.	Stdev.			Min.	Ave.	Max.	Stdev.	
1	100% (8A)	6.478	7.035	7.644	0.389	PASSED	28A	0.159	0.256	0.348	0.063	PASSED
2		6.458	7.079	7.748	0.390	PASSED		0.182	0.215	0.261	0.026	PASSED
3		6.521	6.928	7.446	0.249	PASSED		0.178	0.253	0.335	0.044	PASSED

13. ELECTRICAL CHARACTERIZATION

Criteria: Fuses shall meet individual part specifications
Test Condition: Subject the fuses to the following tests:

i. Current Carrying Capacity – 30 Fuses per lot per temperature

Test Reference: Device specification
Criteria: Fuses shall exhibit no physical, mechanical or electrical damage.
Test Condition: 4 hrs at 100% rated current (I_{RAT}), 25ºC
Final device resistance measurement
Results: All fuses passed successfully.

04401.75WR - Current Carrying Capacity													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Remarks
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.506	40.019	41.259	0.708	38.341	39.901	41.517	0.820	38.232	40.022	41.345	0.733	PASSED
2	38.396	40.066	42.133	0.846	38.473	40.202	41.800	0.846	38.201	40.012	41.661	0.909	PASSED
3	38.454	39.845	41.538	0.769	38.142	39.972	41.235	0.609	38.474	40.056	42.355	0.862	PASSED

440GT Validation Test Electrical 8A - Current Carrying Capacity													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Post Test Resistance mΩ				Remarks
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.430	7.157	7.930	0.379	6.440	7.198	7.951	0.391	6.432	7.197	7.941	0.387	PASSED
2	6.430	7.110	7.890	0.368	6.490	7.150	7.918	0.359	6.486	7.143	7.910	0.357	PASSED
3	6.440	6.994	7.790	0.345	6.540	7.061	7.900	0.344	6.520	7.044	7.895	0.345	PASSED

ii. Overload Test – 30 Fuses per lot per temperature

Test Reference: Device specification
Criteria: Fuses shall meet individual part specifications
Test Condition: Conduct overload test at 350%
Fuses shall open before 5 seconds
Results All fuses passed successfully.

04401.75WR - Overload Test													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Opening Time secs				Remarks
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	38.044	39.949	42.072	0.964	38.330	40.007	41.937	0.734	1.892	2.255	2.511	1.377	PASSED
2	38.565	39.832	42.209	0.807	38.629	40.198	41.797	0.806	1.853	2.038	2.550	1.022	PASSED
3	38.658	39.847	41.344	0.712	38.749	39.989	41.222	0.772	1.934	2.320	3.151	0.865	PASSED

0440008.WR - Overload Test													
Lot No.	Initial Loose Resistance mΩ				Onboard Resistance mΩ				Opening Time secs				Remarks
	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	Min.	Ave.	Max.	Stdev.	
1	6.400	7.063	7.940	0.408	6.450	7.104	7.980	0.402	1.697	3.045	4.647	0.879	PASSED
2	6.470	7.205	7.930	0.401	6.540	7.230	7.990	0.401	1.535	2.621	4.102	0.720	PASSED
3	5.860	7.056	7.860	0.395	6.620	7.166	7.940	0.324	1.674	2.778	3.990	0.604	PASSED

iii.Short Circuit Interrupting Ability – 30 Fuses per lot

Test Reference: Device specification
Criteria: Fuses shall meet individual part specifications
Test Condition: Fuses shall be subjected to tests at the voltages (s); current (s); power factors (AC) and time constants (DC) specified in the fuse specification sheet at minimum, room and maximum operating temperatures. For mid-ratings, conduct the test at room temp (25C) only.
Results: All fuses passed successfully.

04401.75WR SC Test										
LOTS	Initial Loose Resistance mΩ				Onboard Resistance @ 25°C mΩ				Test Condition	Test Result
	Min	Ave	Max	Stdev	Min	Ave	Max	Stdev		
1	38.764	40.169	41.507	0.702	38.945	40.155	41.107	0.620	50A, 32VAC	PASSED
2	38.312	40.055	41.756	0.831	38.955	40.028	41.989	0.825		
3	37.992	40.032	41.505	0.771	38.534	40.076	41.181	0.597		

0440008.WR SC Test										
LOTS	Initial Loose Resistance mΩ				Onboard Resistance @ 25°C mΩ				Test Condition	Test Result
	Min	Ave	Max	Stdev	Min	Ave	Max	Stdev		
1	6.6400	7.0813	7.6600	0.2391	6.7880	7.2160	7.7990	0.2336	50A, 32VAC	PASSED
2	6.5400	7.0890	7.6200	0.3287	6.6470	7.1709	7.7150	0.3305		
3	6.3200	6.9790	7.4900	0.2562	6.4620	7.1013	7.5480	0.2623		

04401.75WR SC Test										
LOTS	Initial Loose Resistance mΩ				Onboard Resistance @ 25°C mΩ				Test Condition	Test Result
	Min	Ave	Max	Stdev	Min	Ave	Max	Stdev		
1	38.177	39.851	41.251	0.860	38.789	40.110	41.341	0.579	50A, 32VDC	PASSED
2	38.971	40.266	42.584	0.805	38.734	39.958	41.235	0.641		
3	38.299	39.968	41.449	0.782	38.723	40.329	41.890	0.778		

0440008.WR SC Test										
LOTS	Initial Loose Resistance mΩ				Onboard Resistance @ 25°C mΩ				Test Condition	Test Result
	Min	Ave	Max	Stdev	Min	Ave	Max	Stdev		
1	6.4200	7.0070	7.7000	0.3549	6.5050	7.1454	7.8400	0.3550	50A, 32VDC	PASSED
2	6.2900	7.0210	7.8100	0.3891	6.4530	7.1421	7.9650	0.3922		
3	6.4100	7.0023	7.7400	0.3465	6.5200	7.1026	7.8170	0.3513		

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