

To : Valued Customer
From : Littelfuse Product Management

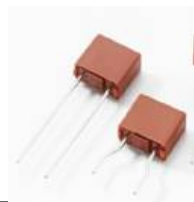
Subject : **LFPCN 41468: Conversion to Red Phosphorus-Free (Red-P free) for TE5 369 Fuse Series and TE5 392 Fuse Series 6.3Ampere.**

This is a 60-day PCN.

This is to communicate that we will fan-out the implementation of Red Phosphorus-free (Red-P free) conversion on our TE5 369 Fuse Series and TE5 392 Fuse Series 6.3A.

Below are the details of the change.

1. Fuse Color Change from “RED” to “BLACK”.



Before/Existing



After

In terms of electrical characteristics of the fuses, electrical performance of both the existing fuses and the Red-P free version are similar.

There are no changes in the agency certificate of the TE5 369 Fuse Series and TE5 392 Fuse Series 6.3A Red P Free versions.

The Red-P free version of the TE369 will have the same existing datasheet as the existing TE369 series. There will also be no changes to the labels.

Date of implementation

This will be a running change in Littelfuse mass production from 18th March 2023 onwards.

Affected Part Numbers

-392 series (6.3A only)

39216300000

39216300075

39216300440

-369 series

36908000440

36911000000

36911000440

36911600000

36911600440

36912000000

36912000440

36913150000

36913150440

36914000000

36914000440

36915000000

36915000440

36916300000

36916300440

Please let us know if you have further queries.

Best regards,
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TE369 Red Phosphorus (P) Free Validation Report

TE369 Series

TE369 Series TE5[®] Time Lag
Subminiature Fuse
300V- IEC 60127-3



Expertise Applied | Answers Delivered

I. Objective

This report provides the summary of the validation test performance of the **TE369 RED PHOSPHORUS FREE** series in accordance with Littelfuse document VS-006116, Validation Specification Test Plan for TR/TE Fuses. The results reflected is for part number 36908000000 (0.80A) and 36916300000 (6.30A) , minimum and maximum design break to represent all ratings for the series from 0.80 A to 6.30A .

Product Specification

Part Number	Fuse Rating (A)	Cold Resistance Limits (Ω)	Maximum Rated Voltage (V)	Max. Melting Integral I^2t (A^2sec) - 10In	Nom. Voltage Drop (mV)
36908000000	0.800	0.072 - 0.120	300 VAC	5.120	110
36916300000	6.300	0.00635 - 0.00896	300 VAC	160.740	65

Electrical Current -Time Characteristics

% Load Current	Opening Time
150% Ir	1 hour Minimum
210% Ir	120sec Maximum
275% Ir	400ms Minimum ; 10sec Maximum
400% Ir	150ms Minimum ; 3sec Maximum
1000% Ir	20ms Minimum ; 150ms Maximum

Interrupting Rating Characteristic

Fuse Rating (A)	Interrupting Rating (A)	Rated Voltage (V)	Insulation Resistance
0.800	50 A	300 VAC	100K Ω min @600 VDC
6.300	50 A	300 VAC	100K Ω min @600 VDC

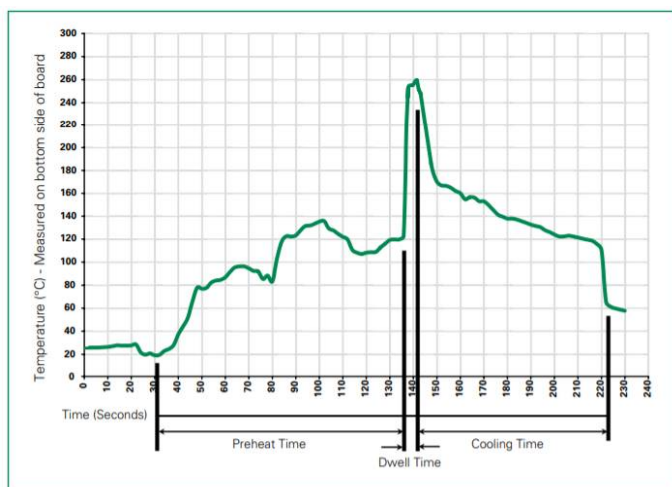
II. Methodology

II.1 General Samples and Collection Plan

Process Validation: 30 samples/lot x3 lots.

II.2 Part Preparation and Pre-Test

1. Loose resistance measurement .
2. Board mounting with one hour in room ambient for cooling. Mounted resistance measurement
3. All tests are conducted on appropriate test boards with appropriate copper traces. Fuses are mounted to test boards with one time (1) pass through the wave solder or hand soldering, using a sample profile shown in table below.



Recommended Process Parameters:

Wave Parameter	Lead-Free Recommendation
Preheat: (Depends on Flux Activation Temperature)	(Typical Industry Recommendation)
Temperature Minimum:	100°C
Temperature Maximum:	150°C
Preheat Time:	60-180 seconds
Solder Pot Temperature:	260°C Maximum
Solder Dwell Time:	2-5 seconds

Recommended Hand-Solder Parameters:

Solder Iron Temperature: 350°C +/- 5°C

Heating Time: 5 seconds max.

Note: These devices are not recommended for IR or Convection Reflow process.

III. References

- Littelfuse document VS-006116, Validation Specification Test Plan for TR/TE Fuses
- Littelfuse Engineering Test Request System (ETR System)

IV. Summary of Validation Test Result

Specification No. VS-006196 REV. C June. 14, 2022

Item No	TEST ITEM	REFERENCE STANDARD	TEST REQUIREMENTS	CRITERIA	POST TEST	500mA	6.3A
Basic Electrical Test	1) Current carrying capacity/ Life Test	Device specification	150% for 1 hour w/o opening or sustaining physical damage.	Fuses shall exhibit no significant physical, mechanical or electrical damage	NA	PASS	PASS
	2) Clearing time-current characteristics (Overload test)	Device specification	Per Datasheet Specification: >210% OL 120sec Max ; >275% OL 400ms Min – 10sec Max >400% OL 150ms Min – 3sec Max >1000% 20ms Min – 150ms Max	Opening times shall be within published limits	NA	PASS	PASS
	3. Short circuit interrupting capability 4.1 Insulation Resistance	Device specification	Per Datasheet Specification: 50A @300VAC	- Fuse may discolor but marking must still be readable - Fuse must remain onboard - No emitting molten metal as evidenced by burnt test board - Insulation resistance measured shall be at least 100 kΩ	NA	PASS	PASS
	4 Endurance Test	IEC 60127-3 standard sheet 4, method A of 9.4.	1. 100% In for 1 hour on / 15 minutes off for 100 cycles. mV drop measurement at 100% before and after endurance test. Fuse Temp Rise at 150% rated Current for 1hr.	Fuses shall exhibit no significant physical, mechanical or electrical damage	NA	PASS	PASS
Environmental Test	5. HTOL (High Temperature Operating Life)	JESD22-A108	1000 Hrs @ 125°C , Standard De-rated and Temperature Re-rated Current	Fuses shall exhibit no physical, mechanical or electrical damage	NA	PASS	PASS
	6. Moisture resistance	MIL-STD-202 Method 106G	1. Perform pre-conditioning at 50°C for 24 hrs. 2) 10 Cycles cycle profile 7a , 24hrs	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
	7. Thermal shock	MIL-STD-202, Method 107G Test condition according to operating temperature	15mins dwell time and 5mins max transition for 100 Cycles	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
	8. Salt fog	MIL-STD-202 METHOD 101G, Test Condition B	5% Salt Solution , 48hrs Duration	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
	9. NO load Humidity	IEC 60068-2-78	504Hrs @ 40°C/ 93% RH	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	NA	PASS	PASS
	10. Heat soak	IEC 60068-2-2	504 hrs at 125°C	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
	11. Cold soak	IEC 60068-2-1	504 hrs at -40°C	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
Mechanical Test	12. Terminal strength	IEC 60068-2-21	Tensile: 10N for 10 sec 4. Thrust: 2N for 10 sec 5.	Fuses shall exhibit no physical, mechanical or electrical damage	NA	PASS	PASS
	13. Mechanical shock	MIL-STD-202 METHOD 213 Test Condition I, unless otherwise specified	De-energized; 100G sawtooth for 6ms ; 6 impacts on 3 mutually perpendicular axes (18 shocks)	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
	14. Low frequency vibration	IEC 60068-2-6	10-60Hz, 0.75 ±0.1mm, 24 cycles at 15 mins each of XYZ planes	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
	15. High frequency vibration	IEC 60068-2-6	10G, 60 – 2000Hz, 24 cycles at 15 mins each of XYZ planes	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
Application Related Test	16. Resistance to soldering heat	IEC 60068-2-20	Test condition > Wave Top-side, 260±50C temp, 10 sec dwell time	- Fuses shall exhibit no physical, mechanical or electrical damage - Pass Post Test	210% OL 150% LT	PASS	PASS
	17. Solderability	MIL-STD-202 METHOD 208H	Steam age: 8 hrs±15 mins 2. Flux immersion time: 3 – 5 secs., Solder temp: 245°C ± 5°C and Solder immersion time: 5 ± 0.5 sec	95% solder coverage	NA	PASS	PASS

V. Data and Results (Electrical Test Result)

1. Current Carrying Capacity / Life Test

800mA
150% LT

150%, 1 Hour Min Current Carrying Capacity, Life Test				
Lot	Data	Board Resistance, Ω	1 Hr Min	Result
Lot 1	Stdev.	0.00202	Completed	Pass
	Min	0.09870		
	Ave	0.10053		
	Max	0.10930		
Lot 2	Stdev.	0.00202	Completed	Pass
	Min	0.09780		
	Ave	0.10051		
	Max	0.10820		
Lot 3	Stdev.	0.00198	Completed	Pass
	Min	0.08700		
	Ave	0.08867		
	Max	0.09450		

6.3A
150% LT

150%, 1 Hour Min Current Carrying Capacity, Life Test				
Lot	Data	Board Resistance, Ω	1 Hr Min	Result
Lot 1	Stdev.	0.24367	Completed	Pass
	Min	6.87000		
	Ave	7.34400		
	Max	7.72000		
Lot 2	Stdev.	0.25533	Completed	Pass
	Min	6.80000		
	Ave	7.35433		
	Max	7.71000		
Lot 3	Stdev.	0.24721	Completed	Pass
	Min	6.97000		
	Ave	7.41000		
	Max	7.83000		

2. Overload Test

800mA
210% OL

210% Overload Test, 120 sec Max				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.00105	0.74	Pass
	Min	0.10320	6.02	
	Ave	0.10749	8.67	
	Max	0.10880	10.79	
Lot 2	Stdev.	0.00295	1.83	Pass
	Min	0.09540	7.88	
	Ave	0.10705	8.91	
	Max	0.10890	17.53	
Lot 3	Stdev.	0.00314	11.94	Pass
	Min	0.08940	8.53	
	Ave	0.09663	19.27	
	Max	0.10840	72.80	

6.3A
210% OL

210% Overload Test, 120 sec Max				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.21734	9.32	Pass
	Min	6.96300	27.16	
	Ave	7.43630	41.61	
	Max	7.97600	66.90	
Lot 2	Stdev.	0.20092	10.15	Pass
	Min	7.25000	23.20	
	Ave	7.75567	37.43	
	Max	8.18000	65.22	
Lot 3	Stdev.	0.22644	9.36	Pass
	Min	7.28000	19.99	
	Ave	7.89300	29.67	
	Max	8.29000	58.09	

V. Data and Results (Electrical Test Result)

2. Overload Test

800mA
275% OL

275% Overload Test, 0.400 sec - 10 sec				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.00068	0.09	Pass
	Min	0.10760	2.28	
	Ave	0.10866	2.38	
	Max	0.11060	2.77	
Lot 2	Stdev.	0.00217	0.07	Pass
	Min	0.09850	2.29	
	Ave	0.10832	2.37	
	Max	0.10970	2.57	
Lot 3	Stdev.	0.00281	0.15	Pass
	Min	0.08680	2.49	
	Ave	0.09857	2.76	
	Max	0.10410	3.39	

6.3A
275% OL

275% Overload Test, 0.400 sec - 10 sec				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.20517	0.32	Pass
	Min	7.41000	1.01	
	Ave	7.83967	2.20	
	Max	8.39000	2.67	
Lot 2	Stdev.	0.20163	0.20	Pass
	Min	7.57000	1.89	
	Ave	7.88933	2.22	
	Max	8.35000	2.74	
Lot 3	Stdev.	0.25680	0.27	Pass
	Min	7.23000	1.07	
	Ave	7.85967	2.12	
	Max	8.38000	2.64	

800mA
400% OL

400% Overload Test, 0.150 sec - 3 sec				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.00073	0.02	Pass
	Min	0.10460	0.80	
	Ave	0.10571	0.83	
	Max	0.10710	0.87	
Lot 2	Stdev.	0.00114	0.01	Pass
	Min	0.10410	0.79	
	Ave	0.10561	0.83	
	Max	0.10840	0.85	
Lot 3	Stdev.	0.00167	0.02	Pass
	Min	0.09180	0.85	
	Ave	0.09558	0.90	
	Max	0.09750	0.96	

6.3A
400% OL

400% Overload Test, 0.150 sec - 3 sec				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.16144	0.02	Pass
	Min	7.36000	0.38	
	Ave	7.72300	0.43	
	Max	8.08000	0.48	
Lot 2	Stdev.	0.19292	0.02	Pass
	Min	7.40000	0.37	
	Ave	7.75767	0.42	
	Max	8.14000	0.46	
Lot 3	Stdev.	0.20971	0.04	Pass
	Min	7.40000	0.23	
	Ave	7.73400	0.41	
	Max	8.13000	0.46	

V. Data and Results (Electrical Test Result)

2. Overload Test

800mA
1000% OL

1000% Overload Test, 0.020 sec - 0.150 sec				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.00497	0.00	Pass
	Min	0.10230	0.08	
	Ave	0.10434	0.08	
	Max	0.13040	0.08	
Lot 2	Stdev.	0.00644	0.00	Pass
	Min	0.10180	0.08	
	Ave	0.10531	0.08	
	Max	0.12740	0.08	
Lot 3	Stdev.	0.00055	0.00	Pass
	Min	0.09110	0.08	
	Ave	0.09199	0.09	
	Max	0.09290	0.09	

6.3A
1000% OL

1000% Overload Test, 0.020 sec - 0.150 sec				
Lot	Data	Board Resistance, Ω	Opening Time in sec	Result
Lot 1	Stdev.	0.24626	0.00	Pass
	Min	7.34000	0.04	
	Ave	7.86333	0.04	
	Max	8.40000	0.04	
Lot 2	Stdev.	0.19771	0.00	Pass
	Min	7.25000	0.04	
	Ave	7.69067	0.04	
	Max	8.10000	0.04	
Lot 3	Stdev.	0.24064	0.00	Pass
	Min	7.15000	0.03	
	Ave	7.67567	0.04	
	Max	8.07000	0.04	

3. Short Circuit

500mA
Short Circuit

Short Circuit 50A @ 300VAC				
Lot	Data	Board Resistance, Ω	Insulation Resistance	Short Circuit Result
Lot 1	Stdev.	0.25888	> 100 K Ω	Pass
	Min	6.74000		
	Ave	7.18867		
	Max	7.64000		
Lot 2	Stdev.	0.39500	> 100 K Ω	Pass
	Min	5.99500		
	Ave	6.64913		
	Max	7.59300		
Lot 3	Stdev.	0.41723	> 100 K Ω	Pass
	Min	5.64900		
	Ave	6.46717		
	Max	7.29900		

6.3A
Short Circuit

Short Circuit 50A @ 300VAC				
Lot	Data	Board Resistance, Ω	Insulation Resistance	Short Circuit Result
Lot 1	Stdev.	0.29284	> 100 K Ω	Pass
	Min	6.34800		
	Ave	7.04410		
	Max	7.58000		
Lot 2	Stdev.	0.25888	> 100 K Ω	Pass
	Min	6.74000		
	Ave	7.18867		
	Max	7.64000		
Lot 3	Stdev.	0.30693	> 100 K Ω	Pass
	Min	6.61800		
	Ave	7.24473		
	Max	7.65800		

V. Data and Results (Electrical Test Result)

4. Endurance Test

800mA Endurance Test Result

Endurance Test												
Lot	Data	Loose Resistance, Ω	On-board Resistance, Ω	100% Life Test	Voltage Drop mV <100mV	Electrical Cycle 1hr ON/ 15 minutes OFF	Voltage Drop@ 1.2A	Temp Rise Terminal 1 <150C	Temp Rise Terminal 2 <150C	Temp Rise Body <135C	Maximum Power Dissipation <1600mW	150% LT
Lot1	Stdev.	0.00179	0.00170	Pass	1.812	Pass	4.504	1.107	2.405	0.962	5.405	Pass
	Min.	0.098	0.098		88.240		148.610	9.462	4.388	9.408	178.332	
	Ave.	0.101	0.100		90.926		156.444	10.822	8.512	10.808	187.733	
	Max.	0.104	0.103		94.550		167.120	12.784	11.181	12.249	200.544	
Lot2	Stdev.	0.00238	0.00233	Pass	2.509	Pass	9.415	0.856	1.045	0.912	11.298	Pass
	Min.	0.099	0.098		88.380		152.040	8.035	8.303	9.716	182.448	
	Ave.	0.103	0.102		92.805		162.840	9.708	10.207	10.779	195.408	
	Max.	0.107	0.106		96.550		193.190	10.902	11.294	12.101	231.828	
Lot3	Stdev.	0.00379	0.00374	Pass	3.968	Pass	11.057	0.847	1.145	1.562	13.269	Pass
	Min.	0.095	0.093		84.140		146.390	10.416	6.792	7.862	175.668	
	Ave.	0.101	0.099		90.297		161.797	11.557	8.810	10.559	194.157	
	Max.	0.107	0.106		97.200		194.390	12.838	10.484	12.497	233.268	

6.3A Endurance Test Result

Endurance Test												
Lot	Data	Loose Resistance, Ω	On-board Resistance, Ω	100% Life Test	Voltage Drop mV <100mV	Electrical Cycle 1hr ON/ 15 minutes OFF	Voltage Drop@ 9.45A	Temp Rise Terminal 1 <150C	Temp Rise Terminal 2 <150C	Temp Rise Body <135C	Maximum Power Dissipation <1600mW	150% LT
Lot1	Stdev.	0.266	0.435	Pass	3.091	Pass	6.343	10.848	3.244	9.007	59.943	Pass
	Min.	6.780	6.259		44.860		79.560	43.714	30.679	54.509	751.842	
	Ave.	7.190	6.711		48.510		88.768	70.281	36.605	72.268	838.854	
	Max.	8.030	7.680		56.370		105.520	81.175	41.806	83.224	997.164	
Lot2	Stdev.	0.174	0.400	Pass	2.405	Pass	4.516	7.399	3.186	5.157	42.673	Pass
	Min.	6.850	6.286		45.610		82.270	48.107	25.124	57.022	777.452	
	Ave.	7.171	6.716		48.070		86.683	64.980	31.734	66.492	819.158	
	Max.	7.620	7.570		54.430		99.720	71.073	35.258	71.636	942.354	
Lot3	Stdev.	0.293	0.435	Pass	2.806	Pass	6.334	6.896	2.817	7.425	59.852	Pass
	Min.	6.810	6.356		46.000		82.160	57.155	28.757	52.635	776.412	
	Ave.	7.276	6.822		48.536		88.206	70.693	34.262	65.722	833.547	
	Max.	8.360	7.920		58.940		114.020	77.162	38.028	76.243	1077.489	

V. Data and Results (Environmental Test Result)

5. HTOL (High Temperature Operating Life)

800mA HTOL, 1000hrs

HTOL (High Temperature Operating Life)				
Lot	Data	Board Resistance, Ω	1000 hrs	Result
Lot 1	Stdev.	0.00146	No Open Fuse No Damage	Pass
	Min	0.09300		
	Ave	0.09763		
	Max	0.10140		
Lot 2	Stdev.	0.00316	No Open Fuse No Damage	Pass
	Min	0.09110		
	Ave	0.09751		
	Max	0.10710		
Lot 3	Stdev.	0.00160	No Open Fuse No Damage	Pass
	Min	0.08280		
	Ave	0.08587		
	Max	0.09220		

6.3A HTOL, 1000hrs

HTOL (High Temperature Operating Life)				
Lot	Data	Board Resistance, Ω	1000 hrs	Result
Lot 1	Stdev.	0.32680	No Open Fuse No Damage	Pass
	Min	6.48000		
	Ave	6.97000		
	Max	8.43000		
Lot 2	Stdev.	0.18310	No Open Fuse No Damage	Pass
	Min	6.55000		
	Ave	6.88833		
	Max	7.28000		
Lot 3	Stdev.	3.22571	No Open Fuse No Damage	Pass
	Min	0.18310		
	Ave	5.38853		
	Max	8.43000		

V. Data and Results (Environmental Test Result)

6. Moisture Resistance

800mA Moisture Resistance

Moisture Resistance					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.00053	No Open Fuse Damage	0.70	Pass
	Min	0.09800		10.57	
	Ave	0.09912		11.69	
	Max	0.09990		12.80	
Lot 2	Stdev.	0.00063	No Open Fuse Damage	0.75	Pass
	Min	0.09770		11.00	
	Ave	0.09937		12.09	
	Max	0.10070		13.64	
Lot 3	Stdev.	0.00216	No Open Fuse Damage	18.44	Pass
	Min	0.08560		35.48	
	Ave	0.08729		79.00	
	Max	0.09660		94.92	

6.3A Moisture Resistance

Moisture Resistance					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.18025	No Open Fuse Damage	10.37	Pass
	Min	6.85000		28.06	
	Ave	7.21833		39.66	
	Max	7.51000		59.31	
Lot 2	Stdev.	0.20272	No Open Fuse Damage	7.65	Pass
	Min	6.85100		25.49	
	Ave	7.15730		37.37	
	Max	7.55000		47.65	
Lot 3	Stdev.	3.24965	No Open Fuse Damage	17.72	Pass
	Min	0.18025		7.65	
	Ave	5.43995		31.94	
	Max	7.55000		59.31	

V. Data and Results (Environmental Test Result)

7. Thermal Shock

800mA Thermal Shock

Thermal Shock					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.00051	No Open Fuse Damage	0.48	Pass
	Min	0.10030		9.95	
	Ave	0.10093		10.46	
	Max	0.10210		11.77	
Lot 2	Stdev.	0.00181	No Open Fuse Damage	0.74	Pass
	Min	0.09970		7.91	
	Ave	0.10144		10.03	
	Max	0.10970		10.89	
Lot 3	Stdev.	0.04361	No Open Fuse Damage	5.91	Pass
	Min	0.00046		13.98	
	Ave	0.07424		32.52	
	Max	0.10970		37.60	

6.3A Thermal Shock

Thermal Shock					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.43246	No Open Fuse Damage	12.09	Pass
	Min	6.60600		25.77	
	Ave	7.04983		39.28	
	Max	7.89000		61.71	
Lot 2	Stdev.	0.20001	No Open Fuse Damage	15.66	Pass
	Min	7.21000		26.96	
	Ave	7.46231		47.30	
	Max	7.85000		70.71	
Lot 3	Stdev.	0.32594	No Open Fuse Damage	17.49	Pass
	Min	6.81000		20.14	
	Ave	7.26714		49.91	
	Max	7.90000		78.59	

V. Data and Results (Environmental Test Result)

8. Salt Fog

800mA Salt Fog

Salt Fog					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.00046	No Open Fuse Damage	0.66	Pass
	Min	0.10070		10.05	
	Ave	0.10174		10.72	
	Max	0.10270		12.24	
Lot 2	Stdev.	0.00123	No Open Fuse Damage	1.18	Pass
	Min	0.09790		9.82	
	Ave	0.10185		11.69	
	Max	0.10580		14.17	
Lot 3	Stdev.	0.04499	No Open Fuse Damage	15.49	Pass
	Min	0.00046		15.34	
	Ave	0.07284		45.63	
	Max	0.10970		72.47	

6.3A Salt Fog

Salt Fog					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.24280	No Open Fuse Damage	14.30	Pass
	Min	6.86000		23.77	
	Ave	7.21231		45.90	
	Max	7.58000		69.35	
Lot 2	Stdev.	0.36197	No Open Fuse Damage	7.23	Pass
	Min	6.51500		28.82	
	Ave	7.03857		35.74	
	Max	7.55000		52.14	
Lot 3	Stdev.	0.35617	No Open Fuse Damage	10.23	Pass
	Min	6.60800		22.28	
	Ave	7.04917		36.05	
	Max	7.63000		53.62	

V. Data and Results (Environmental Test Result)

9. No Load Humidity

800mA No Load Humidity. 504Hrs

No Load Humidity					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.00042	No Open Fuse Damage	0.38	Pass
	Min	0.10170		9.93	
	Ave	0.10243		10.36	
	Max	0.10340		11.16	
Lot 2	Stdev.	0.00219	No Open Fuse Damage	1.06	Pass
	Min	0.09590		7.95	
	Ave	0.10259		10.40	
	Max	0.10970		12.37	
Lot 3	Stdev.	0.00185	No Open Fuse Damage	5.02	Pass
	Min	0.09000		29.67	
	Ave	0.09120		37.27	
	Max	0.10060		43.87	

6.3A No Load Humidity. 504Hrs

No Load Humidity					
Lot	Data	Board Resistance, Ω	Result	210% Overload Opening Time, 120 sec Max	Post 150% Life Test, 1 Hr Min
Lot 1	Stdev.	0.43764	No Open Fuse Damage	12.97	Pass
	Min	6.32200		20.41	
	Ave	6.89377		40.06	
	Max	7.81000		64.30	
Lot 2	Stdev.	0.47872	No Open Fuse Damage	20.76	Pass
	Min	6.36000		15.42	
	Ave	6.88877		41.59	
	Max	8.03000		92.16	
Lot 3	Stdev.	0.43146	No Open Fuse Damage	17.90	Pass
	Min	6.38300		19.45	
	Ave	6.91737		40.38	
	Max	7.74000		87.47	

V. Data and Results (Environmental Test Result)

10. Heat Soak

800mA Heat Soak. 504Hrs

Heat Soak					
Lot	Data	On-board Resistance, Ω	Heat Soak at 125C for 504 hours	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.00101	No Open Fuse No Damage	Pass	0.36008
	Min.	0.102			7.472
	Ave.	0.103			7.998
	Max.	0.107			8.547
Lot 2	Stdev.	0.00164	No Open Fuse No Damage	Pass	0.61847
	Min.	0.100			7.169
	Ave.	0.103			8.086
	Max.	0.110			9.376
Lot 3	Stdev.	0.00141	No Open Fuse No Damage	Pass	1.66369
	Min.	0.089			11.479
	Ave.	0.092			16.481
	Max.	0.097			18.921

6.3A Heat Soak . 504Hrs

Heat Soak					
Lot	Data	Board Resistance, Ω	Heat Soak at 125C/504hours	Post 150% Life Test 1Hr Min	Post 210% Overload Opening time 120sec Max
Lot 1	Stdev.	0.232	No Open Fuse No Damage	Pass	16.279
	Min.	6.760			23.270
	Ave.	7.236			37.718
	Max.	7.600			80.980
Lot 2	Stdev.	0.083	No Open Fuse No Damage	Pass	11.426
	Min.	6.908			27.170
	Ave.	7.091			41.413
	Max.	7.230			62.870
Lot 3	Stdev.	0.242	No Open Fuse No Damage	Pass	10.626
	Min.	6.730			16.610
	Ave.	7.254			31.992
	Max.	7.780			45.620

V. Data and Results (Environmental Test Result)

11. Cold Soak

800mA Cold Soak. 504Hrs

Cold Soak					
Lot	Data	On-board Resistance, Ω	Cold Soak at -40C for 504 hours	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.00036	No Open Fuse No Damage	Pass	0.426
	Min.	0.102			9.820
	Ave.	0.103			10.649
	Max.	0.104			11.380
Lot 2	Stdev.	0.001	No Open Fuse No Damage	Pass	0.541
	Min.	0.101			9.300
	Ave.	0.103			10.362
	Max.	0.107			11.190
Lot 3	Stdev.	0.001	No Open Fuse No Damage	Pass	4.141
	Min.	0.086			28.130
	Ave.	0.091			35.071
	Max.	0.093			44.460

6.3A Cold Soak . 504Hrs

Cold Soak					
Lot	Data	Board Resistance, Ω	Cold Soak at -40C/504hours	Post 150% Life Test 1Hr Min	Post 210% Overload Opening time 120sec Max
Lot 1	Stdev.	0.283	No Open Fuse No Damage	Pass	13.916
	Min.	6.710			22.350
	Ave.	7.210			46.398
	Max.	7.830			71.610
Lot 2	Stdev.	0.279	No Open Fuse No Damage	Pass	17.205
	Min.	6.660			23.060
	Ave.	7.293			41.854
	Max.	7.870			82.390
Lot 3	Stdev.	0.277	No Open Fuse No Damage	Pass	12.697
	Min.	6.760			18.790
	Ave.	7.357			32.398
	Max.	7.920			59.050

V. Data and Results (Mechanical Test Result)

12. Mechanical Shock

800mA Mechanical Shock

Mechanical Shock						
Lot	Data	Board Resistance, Ω	100G sawtooth for 6ms	Post Test Resistance	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.000483	No Open Fuse No Damage	0.000470	Pass	0.324513
	Min.	0.103		0.104		7.995
	Ave.	0.104		0.105		8.416
	Max.	0.105		0.105		8.983
Lot 2	Stdev.	0.000556	No Open Fuse No Damage	0.001065	Pass	0.544289
	Min.	0.104		0.099		8.116
	Ave.	0.104		0.104		8.749
	Max.	0.106		0.106		10.300
Lot 3	Stdev.	0.001373	No Open Fuse No Damage	0.001383	Pass	6.102602
	Min.	0.089		0.089		15.270
	Ave.	0.093		0.093		19.294
	Max.	0.098		0.098		40.860

6.3A Mechanical Shock

Mechanical Shock						
Lot	Data	Board Resistance, Ω	100G sawtooth for 6ms	Post Test Resistance	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.272119	No Open Fuse No Damage	0.217102	Pass	13.182802
	Min.	6.683		6.877		20.420
	Ave.	7.164		7.323		34.531
	Max.	7.667		7.709		64.700
Lot 2	Stdev.	0.267854	No Open Fuse No Damage	0.280856	Pass	18.113941
	Min.	6.642		6.673		22.530
	Ave.	7.275		7.345		38.529
	Max.	7.767		7.827		81.010
Lot 3	Stdev.	0.273537	No Open Fuse No Damage	0.250726	Pass	6.989472
	Min.	6.910		6.873		21.940
	Ave.	7.338		7.333		32.108
	Max.	7.998		7.738		43.100

V. Data and Results (Mechanical Test Result)

13. High Frequency Vibration (HFV)

800mA High Frequency Vibration (HFV)

High Frequency Vibration (HFV)						
Lot	Data	Board Resistance, Ω	Result	Post Test Resistance	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.00084	No Open Fuse No Damage	0.00081	Pass	0.43941
	Min.	0.104		0.104		7.478
	Ave.	0.105		0.106		8.153
	Max.	0.108		0.108		9.280
Lot 2	Stdev.	0.00154	No Open Fuse No Damage	0.00153	Pass	0.57735
	Min.	0.101		0.101		6.915
	Ave.	0.105		0.105		8.283
	Max.	0.109		0.109		9.025
Lot 3	Stdev.	0.00119	No Open Fuse No Damage	0.00121	Pass	0.87365
	Min.	0.089		0.090		13.930
	Ave.	0.095		0.095		14.896
	Max.	0.095		0.096		17.170

6.3A High Frequency Vibration (HFV)

High Frequency Vibration (HFV)						
Lot	Data	Board Resistance, Ω	Result	Post Test Resistance	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.21358	No Open Fuse No Damage	0.28763	Pass	7.95531
	Min.	6.842		6.692		19.910
	Ave.	7.284		7.212		32.937
	Max.	7.674		7.789		46.960
Lot 2	Stdev.	0.28578	No Open Fuse No Damage	0.26992	Pass	9.03898
	Min.	6.600		6.670		18.050
	Ave.	7.311		7.306		29.558
	Max.	7.782		7.797		51.490
Lot 3	Stdev.	0.24430	No Open Fuse No Damage	0.28033	Pass	12.13834
	Min.	6.869		6.900		18.140
	Ave.	7.313		7.327		34.761
	Max.	7.721		7.988		55.390

V. Data and Results (Mechanical Test Result)

14. Low Frequency Vibration (LFV)

800mA Low Frequency Vibration (HFV)

Low Frequency Vibration (LFV)						
Lot	Data	Board Resistance, Ω	Result	Post Test Resistance	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.00045	No Open Fuse No Damage	0.00042	Pass	0.20876
	Min.	0.104		0.104		8.115
	Ave.	0.105		0.105		8.536
	Max.	0.106		0.106		8.890
Lot 2	Stdev.	0.00071	No Open Fuse No Damage	0.00077	Pass	0.58707
	Min.	0.102		0.103		8.012
	Ave.	0.105		0.105		8.616
	Max.	0.106		0.106		9.859
Lot 3	Stdev.	0.00242	No Open Fuse No Damage	0.00239	Pass	4.24699
	Min.	0.085		0.085		14.450
	Ave.	0.093		0.094		16.504
	Max.	0.096		0.096		31.690

6.3A Low Frequency Vibration (HFV)

Low Frequency Vibration (LFV)						
Lot	Data	Board Resistance, Ω	Result	Post Test Resistance	Post 150% Life Test 1Hr Min	Post 210% Overload Opening Time 120sec max
Lot 1	Stdev.	0.34881	No Open Fuse No Damage	0.34998	Pass	12.23537
	Min.	6.561		6.569		14.870
	Ave.	7.212		7.236		33.969
	Max.	7.895		7.923		49.560
Lot 2	Stdev.	0.30626	No Open Fuse No Damage	0.30047	Pass	15.35634
	Min.	6.792		6.811		19.630
	Ave.	7.281		7.315		38.249
	Max.	7.777		7.808		62.660
Lot 3	Stdev.	0.35499	No Open Fuse No Damage	0.35553	Pass	14.87394
	Min.	6.434		6.446		16.470
	Ave.	7.257		7.267		37.957
	Max.	7.992		8.003		59.960

V. Data and Results (Mechanical Test Result)

15. Terminal Strength

800mA Terminal Strength

Terminal Strength					
Lot	Data	Loose Resistance, Ω	Post Loose Resistance, Ω	Tensile: 10N for 10 sec Thrust: 2N for 10 sec	Remarks
Lot 1	Stdev.	0.00096	0.00095	No Physical and Mechanical Damage	Pass
	Min.	0.103	0.104		
	Ave.	0.105	0.105		
	Max.	0.108	0.108		
Lot 2	Stdev.	0.00078	0.00079	No Physical and Mechanical Damage	Pass
	Min.	0.103	0.103		
	Ave.	0.105	0.105		
	Max.	0.106	0.106		
Lot 3	Stdev.	0.00150	0.00147	No Physical and Mechanical Damage	Pass
	Min.	0.089	0.089		
	Ave.	0.093	0.093		
	Max.	0.095	0.095		

6.3A Terminal Strength

Terminal Strength					
Lot	Data	Loose Resistance, Ω	Post Loose Resistance, Ω	Tensile: 10N for 10 sec Thrust: 2N for 10 sec	Remarks
Lot 1	Stdev.	0.28303	0.27407	No Physical and Mechanical Damage	Pass
	Min.	7.188	7.031		
	Ave.	7.790	7.5908		
	Max.	8.408	8.179		
Lot 2	Stdev.	0.24994	0.265352511	No Physical and Mechanical Damage	Pass
	Min.	7.533	7.273		
	Ave.	8.032	7.7431		
	Max.	8.521	8.38		
Lot 3	Stdev.	0.26945	0.316851437	No Physical and Mechanical Damage	Pass
	Min.	7.206	7.012		
	Ave.	7.958	7.750833333		
	Max.	8.373	8.392		

V. Data and Results (Application Related Test)

16. Resistance to Solder Heat (RTSH)

800mA Resistance to Solder Heat

Resistance to Solder Heat (RTSH)								
Lot	Data	Loose Resistance, Ω	Resistance after Dip, Ω	On-board Resistance, Ω	Solder dip to $260\pm 5^\circ\text{C}$ temp at 10 sec dwell time	Post Test	210% Overload Opening Time 120sec max	Result
Lot 1	Stdev.	0.000	0.001	0.001	Pass	Pass	0.364	Pass
	Min.	0.104	0.103	0.102			7.487	
	Ave.	0.104	0.104	0.103			8.368	
	Max.	0.105	0.107	0.106			8.940	
Lot 2	Stdev.	0.000	0.001	0.001	Pass	Pass	0.364	Pass
	Min.	0.104	0.103	0.102			7.487	
	Ave.	0.104	0.104	0.103			8.368	
	Max.	0.105	0.107	0.106			8.940	
Lot 3	Stdev.	0.000	0.001	0.001	Pass	Pass	0.270	Pass
	Min.	0.104	0.100	0.099			8.010	
	Ave.	0.104	0.103	0.103			8.429	
	Max.	0.105	0.106	0.106			8.950	

6.3A Resistance to Solder Heat

Lot	Data	Loose Resistance, Ω	Resistance after Dip, Ω	Ob-Board Resistance Ω	Solder Dip to $260\pm 5^\circ\text{C}$ Temp at 10sec dwell time	Post Life Test 150% LT 1Hr min	Post Overload Opening time 120sec max	Result
Lot 1	Stdev.	0.287	0.284	0.271	Pass	Pass	16.33574	Pass
	Min.	6.721	6.514	6.251			28.34000	
	Ave.	7.232	7.091	6.727			49.43071	
	Max.	7.651	7.503	7.170			90.64000	
Lot 2	Stdev.	0.335	0.344	0.328	Pass	Pass	20.39325	Pass
	Min.	6.762	6.633	6.270			25.23000	
	Ave.	7.513	7.419	7.038			59.02692	
	Max.	7.918	7.928	7.438			87.55000	
Lot 3	Stdev.	0.354	0.349	0.349	Pass	Pass	18.78003	Pass
	Min.	6.813	6.770	6.312			22.62000	
	Ave.	7.298	7.249	6.812			51.65933	
	Max.	8.055	7.957	7.547			89.06000	

V. Data and Results (Application Related Test)

17. Solderability

800mA Resistance to Solder Heat

Solderability W					
Lot	Data	Loose Resistance, Ω	Before Solderability	After Solderability	Result
Lot 1	Stdev.	0.0024			Achieved 95% solder coverage (30/30)
	Min.	0.0993			
	Ave.	0.1047			
	Max.	0.1090			
Lot 2	Stdev.	0.0026			Achieved 95% solder coverage (30/30)
	Min.	0.0974			
	Ave.	0.1041			
	Max.	0.1080			
Lot 3	Stdev.	0.0038			Achieved 95% solder coverage (30/30)
	Min.	0.0864			
	Ave.	0.0936			
	Max.	0.1021			

6.3A Solderability

Solderability					
Lot	Data	Loose Resistance, Ω	Before Solderability	After Solderability	Result
Lot 1	Stdev.	0.3045			95% Solder Coverage Pass (30/30)
	Min	6.9000			
	Ave	7.3367			
	Max	8.0000			
Lot 2	Stdev.	0.4197			95% Solder Coverage Pass (30/30)
	Min	6.7000			
	Ave	7.3800			
	Max	8.1000			
Lot 3	Stdev.	0.3318			95% Solder Coverage Pass (30/30)
	Min	7.0000			
	Ave	7.4400			
	Max	8.2000			