
Electrical Durability and Temperature Testing of Miniature Slide Switches

1. INTRODUCTION

1.1. Purpose

Testing was performed on Tyco Electronics miniature slide switches to determine their ability to meet electrical durability and temperature testing requirements.

1.2. Scope

This report covers the electrical and environmental performance of miniature slide switches part number 1437575-3. Testing was performed at the Engineering Assurance Product Testing Laboratory between 09Mar09 and 11May09. The test file numbers for this testing are EA2009155T and EA2009350T. This documentation is on file at and available from the Engineering Assurance Product Testing Laboratory.

1.3. Conclusion

The miniature slide switches conformed to the initial and final contact resistance ratings and temperature requirements of product drawing 1437575-3.

1.4. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- ! Temperature: 15 to 35°C
- ! Relative Humidity: 25 to 75%

2. SUMMARY OF TESTING

2.1. Examination of Product

All specimens submitted for testing were representative of normal production lots. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Electrical Durability

All LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 70 milliohms initially and 100 milliohms after testing. All specimens completed 1000 cycles of electrical durability. LLCR was measured initially, finally and every 100 cycles.

Specimen 1 - Low Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	21.70	22.59	16.31
100	22.05	22.11	23.48
200	26.79	25.22	24.20
300	31.50	29.14	25.28
400	46.32	45.18	42.02
500	33.66	25.28	32.22
600	38.18	24.62	27.30
700	44.49	27.68	34.58
800	41.79	30.51	25.90
900	28.07	32.42	31.03
1000	33.94	31.03	26.35

Specimen 1 - High Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	19.10	20.86	20.51
100	18.46	19.64	21.80
200	19.05	20.75	22.00
300	21.20	20.60	20.78
400	21.92	21.45	20.54
500	20.29	21.39	23.73
600	22.33	22.60	20.79
700	24.89	21.99	29.36
800	32.04	24.04	25.25
900	27.52	29.56	25.27
1000	36.26	24.90	24.92

Specimen 2 - Low Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	17.04	15.94	17.45
100	20.01	17.95	21.95
200	19.10	18.99	23.11
300	21.75	21.40	18.25
400	22.19	25.94	19.85
500	23.12	21.72	20.38
600	29.80	26.06	31.01
700	31.96	30.10	28.40
800	35.75	20.55	30.22
900	24.50	20.51	20.82
1000	26.72	21.00	25.05

Specimen 2 - High Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	20.87	19.85	21.82
100	18.45	21.21	20.38
200	21.80	22.00	23.71
300	23.09	20.47	20.13
400	37.22	26.59	28.12
500	32.08	30.14	35.25
600	34.13	31.36	34.59
700	24.14	28.03	42.19
800	29.30	26.35	27.65
900	36.48	36.79	26.21
1000	34.19	35.40	35.45

Specimen 3 - Low Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	18.65	18.22	20.22
100	17.13	18.27	17.45
200	20.38	19.81	20.21
300	23.12	25.25	24.71
400	31.25	18.81	20.04
500	20.94	22.03	20.59
600	28.45	19.27	22.44
700	25.05	23.28	24.91
800	28.84	27.75	23.24
900	34.65	29.09	24.55
1000	37.62	23.72	27.40

Specimen 3 - High Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	16.25	19.34	18.68
100	17.48	17.24	15.88
200	16.27	17.45	17.35
300	16.80	17.73	19.01
400	15.28	19.10	22.30
500	23.14	20.03	23.50
600	19.73	19.86	20.05
700	22.01	19.74	37.20
800	15.97	16.01	23.23
900	18.27	18.30	20.71
1000	23.80	23.93	24.08

Specimen 4 - Low Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	16.11	16.61	19.09
100	18.79	18.42	16.90
200	21.39	21.41	19.75
300	20.55	21.90	20.58
400	18.90	20.57	20.79
500	22.40	19.90	22.63
600	25.36	20.47	24.80
700	30.79	21.41	29.00
800	28.29	22.95	27.60
900	25.30	20.20	24.70
1000	27.12	20.35	34.47

Specimen 4 - High Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	15.53	17.11	16.93
100	17.17	16.48	16.75
200	18.20	18.67	16.86
300	15.83	16.36	17.22
400	22.13	20.59	21.33
500	19.03	21.83	21.25
600	20.21	21.59	18.70
700	22.82	25.48	25.30
800	23.07	29.31	28.82
900	27.84	35.82	39.52
1000	30.59	29.06	32.34

Specimen 5 - Low Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	16.43	16.74	19.29
100	18.55	18.58	18.33
200	21.55	21.63	18.17
300	27.08	23.07	33.15
400	26.10	20.47	20.73
500	32.75	25.39	34.93
600	23.35	27.04	41.13
700	29.45	33.87	23.44
800	31.53	28.69	20.45
900	20.63	37.11	23.94
1000	24.50	24.31	21.29

Specimen 5 - High Temperature (mΩ)			
Cycle	Position 1	Position 2	Position 3
Initial	18.45	18.83	23.99
100	19.00	19.66	19.60
200	17.66	20.32	20.51
300	20.29	23.52	22.35
400	19.89	22.97	23.22
500	21.95	24.74	23.96
600	22.74	19.30	22.49
700	24.60	24.31	23.94
800	21.61	25.72	26.45
900	20.29	25.64	27.61
1000	24.74	39.23	39.35

2.3. Storage Temperature Testing

Five specimens were tested at low temperature (-40°) for 2 hours while 5 specimens were tested at high temperature (85°C) for 2 hours. All specimens were measured for LLCRC initially at ambient conditions (23°C) and then at low and high temperatures every 15 minutes.

LLCR Test Frequency	Specimen Number - Low Temperature (mΩ)				
	1 - Position 1	2 - Position 2	3 - Position 3	4 - Position 1	5 - Position 2
Initial at 23°C	35.79	32.92	53.50	29.10	34.26
Initial at -40°C	40.97	39.76	83.09	47.12	37.86
-40°C at 15 minutes	40.78	39.64	83.86	46.75	37.70
-40°C at 30 minutes	40.76	39.54	83.48	46.02	37.76
-40°C at 45 minutes	41.07	39.28	83.90	45.49	37.70
-40°C at 1 hour	40.30	38.93	84.92	45.21	37.67
-40°C at 1 hour 15 minutes	39.91	38.81	84.96	44.99	37.56
-40°C at 1 hour 30 minutes	39.58	38.64	85.08	44.58	37.47
-40°C at 1 hour 45 minutes	39.47	38.61	84.89	44.51	37.42
-40°C at 2 hours	39.34	38.52	85.55	44.22	37.36
Final at 23°C	33.52	29.61	55.80	41.01	29.72

LLCR Test Frequency	Specimen Number - High Temperature (mΩ)				
	1 - Position 1	2 - Position 2	3 - Position 3	4 - Position 1	5 - Position 2
Initial at 23°C	21.12	27.90	40.94	25.00	35.02
Initial at 85°C	21.81	26.91	38.56	24.03	34.00
85°C at 15 minutes	22.36	27.43	39.73	24.35	31.74
85°C at 30 minutes	22.45	27.44	39.65	24.23	31.53
85°C at 45 minutes	22.51	27.41	39.60	24.20	31.42
85°C at 1 hour	22.51	27.38	39.59	24.18	31.33
85°C at 1 hour 15 minutes	22.52	27.37	39.60	24.10	31.23
85°C at 1 hour 30 minutes	22.54	27.31	39.62	24.10	31.16
85°C at 1 hour 45 minutes	22.53	27.31	39.65	24.03	31.09
85°C at 2 hours	22.55	27.29	39.68	23.99	31.01
Final at 23°C	24.39	27.08	40.84	39.35	49.58

3. TEST METHODS

3.1. Examination of Product

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3.2. Electrical Durability

LLCR measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Specimens were mounted on test boards with 28 AWG bus wire connected to each switch terminal. Each specimen was measured initially for LLCR and then connected to a 10 volt DC power supply with a 7 ohm resistor to obtain a test current of 1.4 amperes. Specimens were manually cycled for 100 cycles at an approximate rate of 10 cycles per minute and then measured for LLCR. This process was repeated every 100 cycles up to 1000 cycles for each specimen.

3.3. Storage Temperature Testing

Specimens were mounted on test boards with 28 AWG bus wire connected to each switch terminal. Specimens 1, 2 and 3 were placed in positions 1, 2 and 3 respectively (see product drawing), specimen 4 was placed in position 1 and specimen 5 in position 2. Five specimens were then placed in an environmental chamber and LLCR measured at ambient conditions (23°C). The chamber was then ramped down to -40°C and LLCR measured initially at that temperature every 15 minutes for a total exposure of 2 hours. Specimens were allowed to return to ambient conditions and final LLCR measurements taken. All LLCR measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. This procedure was repeated on the 5 remaining specimens at 85°C.