Surface Mount .100 Inch Centerline Standard Pitch DIP Switch

1. INTRODUCTION

1.1. Purpose

Testing was performed on the AMP* .100 inch centerline surface mounted Dual-Inline Packaging (DIP) switch to determine its conformance to the requirements of AMP Product Specification 108-1850 Revision B.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the .100 inch centerline surface mounted DIP switch. Testing was performed at the Product Reliability Center of Global Automotive, Americas North between Jan98 and Jun98. The test file number for this testing is ACL 2146-0005. This documentation is on file at and available from the Product Reliability Center of Global Automotive, Americas North.

1.3. Conclusion

The .100 inch centerline surface mounted DIP switch listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-1850 Revision B.

1.4. Product Description

The .100 inch centerline surface mounted DIP switch is manually actuated using a slider that connects individual circuits on a printed circuit board. The switches are available in 2 through 12 positions with low profile, flush or raised actuators. The Dip switches are used in signal applications for ON and OFF operations.

1.5. Test Samples

Test samples were representative of normal production lots. Samples identified with the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
1	3	390221-2	2 position surface mount DIP switch (gold/nickel)
	3	1-390221-2	12 position surface mount DIP switch (gold/nickel)
2	3	390221-2	2 position surface mount DIP switch (gold/nickel)
	3	1-390221-2	12 position surface mount DIP switch (gold/nickel)
3	3	390221-2	2 position surface mount DIP switch (gold/nickel)
	3	1-390221-2	12 position surface mount DIP switch (gold/nickel)
4	3	390221-2	2 position surface mount DIP switch (gold/nickel)
	3	1-390221-2	12 position surface mount DIP switch (gold/nickel)
5	3	390221-2	2 position surface mount DIP switch (gold/nickel)
	3	1-390221-2	12 position surface mount DIP switch (gold/nickel)

Figure 1

* Trademark
I Indicates change

1.6. Environmental Conditions

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

Temperature: 15 to 35°C
Relative Humidity: 20 to 80%

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Examination of product	1,9	1,5	1,5	1,8	1,4
Dry circuit resistance	3,7	2,4	2,4		
Insulation resistance				2,6	
Dielectric withstanding voltage				3,7	
Capacitance					3
Vibration	5				
Mechanical shock	6				
Durability	4				
Resistance to soldering heat					2
Actuation force	2,8				
Thermal shock				4	
Humidity-temperature cycling				5	
Temperature life		3			
Mixed flowing gas			3		

NOTE

(a) See Para 4.1.A.
(b) Numbers indicate sequence in which tests are performed.

Figure 2

2. SUMMARY OF TESTING

2.1. Examination of Product - All Test Groups

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

2.2. Termination Resistance - Test Groups 1, 2 and 3

All termination resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 25 milliohms initially and 50 milliohms after testing.

Test Group	Number of Data Points	Condition	Termination Resistance		
			Min	Max	Mean
1	42	Initial	4.27	6.21	5.40
		After mechanical	4.77	8.36	6.84
2	42	Initial	4.42	5.37	4.85
		After temperature life	4.44	5.68	4.79
3	42	Initial	4.65	5.71	5.10
		After mixed flowing gas	4.78	6.57	5.69

NOTE *All values in milliohms.*

Figure 3

2.3. Insulation Resistance - Test Group 4

All insulation resistance measurements were greater than 1000 megohms.

2.4. Dielectric Withstanding Voltage - Test Group 4

No dielectric breakdown or flashover occurred.

2.5. Capacitance - Test Group 5

All capacitance measurements were equal to or less than 5.0 picofarads.

2.6. Vibration - Test Group 1

No discontinuities were detected during vibration. Following vibration, no cracks, breaks, or loose parts on the samples were visible.

2.7. Mechanical Shock - Test Group 1

No discontinuities were detected during mechanical shock. Following mechanical shock testing, no cracks, breaks, or loose parts on the samples were visible.

2.8. Durability - Test Group 1

No physical damage, no open circuit in the ON position and no short circuit in the OFF position occurred to the samples as a result of 2000 actuation (ON/OFF) cycles while energized.

2.9. Resistance to Soldering Heat - Test Group 5

No evidence of physical damage to either the contacts or the samples was visible as a result of soldering heat.

2.10. Actuation Force - Test Group 1

All initial actuation forces were between 100 grams and 700 grams. All final actuation forces were greater than 60 grams.

2.11. Thermal Shock - Test Group 4

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.12. Humidity-temperature Cycling - Test Group 4

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

2.13. Temperature Life - Test Group 2

No evidence of physical damage was visible as a result of exposure to temperature life.

2.14. Mixed Flowing Gas - Test Group 3

No evidence of physical damage was visible as a result of exposure to the pollutants of mixed flowing gas.

3. TEST METHODS

3.1. Examination of Product

Where specified, samples were visually examined for evidence of physical damage detrimental to product performance.

3.2. Termination Resistance

Termination resistance measurements at low level current were made on printed circuit board mounted samples with switches in the ON position using a 4 terminal measuring technique (Figure 4). The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

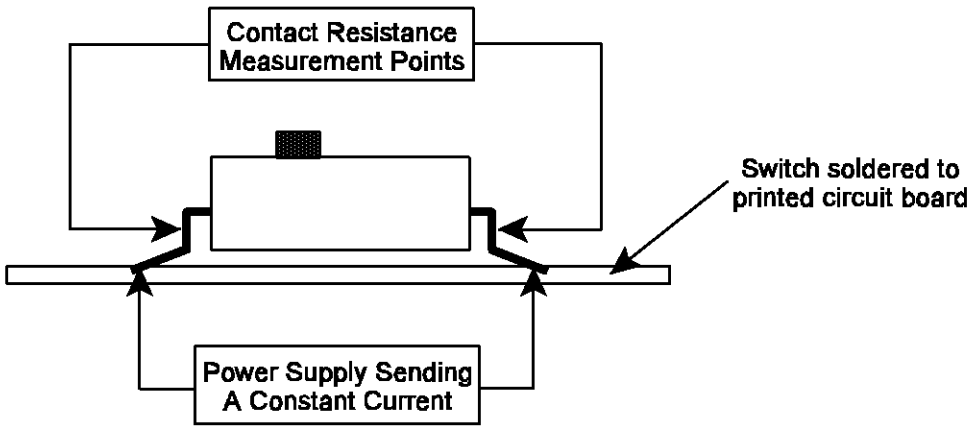

Figure 4
Termination Resistance Measurement Points

3.3. Insulation Resistance

Insulation resistance was measured between adjacent contacts with switch in the ON position and applied across opposite contacts with switch in the OFF position. A test voltage of 500 volts DC was applied for maximum of two minutes before the resistance was measured.

3.4. Dielectric Withstanding Voltage

A test potential of 500 volts (AC) was applied between the adjacent contacts with switch in the ON position and applied across opposite contacts with switch in the OFF position. This potential was applied for 1 minute and then returned to zero.

3.5. Capacitance

Capacitance was measured between adjacent contacts in the ON position using a test frequency of 1.0 MHz.

3.6. Vibration, Random

Printed circuit board mounted samples with switches in the ON position were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 5 and 500 Hz. The power spectral density at 5 Hz was 0.000312 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.02 G^2/Hz at 14 Hz. The spectrum was flat at 0.02 G^2/Hz from 14 to 500 Hz. The root-mean square amplitude of the excitation was 3.13 GRMS. This was performed for 15 minutes in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Samples were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.7. Mechanical Shock, Half-sine

Printed circuit board mounted dip switches with switches in the ON position were subjected to a mechanical shock test having a half-sine waveform of 30 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Samples were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.8. Durability

Printed circuit board mounted dip switches were subjected to 2000 actuation cycles at a maximum rate of 600 cycles per hour with a resistive load of 100 milliamps at 20 volts dc applied.

3.9. Resistance to Soldering Heat

Unmounted dip switches with thermocouples attached to the soldertails exiting the housing were placed in a fan-forced heat oven with the temperature set at 255°C for 55 seconds. Sample temperature reached 255°C within 210 seconds. After heat, samples were allowed to cool and stabilize at room ambient. A visual exam was performed with the unaided eye.

3.10. Actuation Force

The force required to move the actuator (DIP switch) from the OFF position to the ON position and vice versa was measured using a tensile/compression device with the rate of travel at 0.5 inch per minute and a free floating fixture.

3.11. Thermal Shock

Unmounted dip switches in the OFF position were subjected to 5 non-operating cycles of thermal shock with each cycle consisting of 30 minute dwells at -20 and 85°C. The transition between temperatures was less than 1 minute.

3.12. Humidity-temperature Cycling

Unmounted dip switches in the OFF position were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity Figure 5).

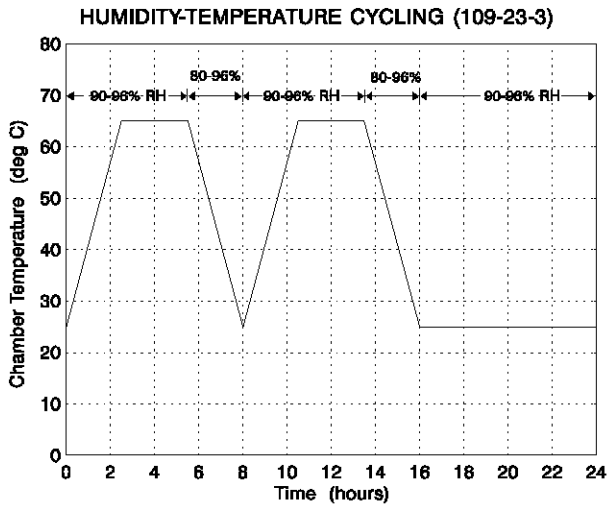

Figure 5
Typical Humidity-Temperature Cycling Profile

3.13. Temperature Life

Printed circuit board mounted samples with switches in the ON position were exposed to a temperature of 85°C for 1000 hours.

3.14. Mixed Flowing Gas, Class II

Printed circuit board mounted samples with switches in the ON position were exposed for 14 days to a mixed flowing gas Class II exposure. Class II exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, and H_2S at 10 ppb. Samples were preconditioned with 10 cycles of durability.