

Surface Mount Right Angle DIP Switch**1. INTRODUCTION****1.1. Purpose**

Testing was performed on the AMP* surface mount right angle Dual-Inline Packaging (DIP) switch to determine its conformance to the requirements of AMP Product Specification 108-1860 Revision B.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the surface mount right angle DIP switch. Testing was performed at the Americas Global Automotive Division Product Reliability Center, the test file number for this testing is 19980139ACLa. This documentation is on file at and available from the Americas Global Automotive Division Product Reliability Center.

1.3. Conclusion

The surface mount right angle DIP switch listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-1860 Revision B.

1.4. Product Description

The surface mountable right angle DIP switches are manually operated using a rocker that connects individual circuits on a customer provided printed circuit board (PCB). They are designed to be applied directly to the surface of the PCB on a prescribed solder pad layout by conventional methods used in surface mount technology including infrared reflow and vapor phase soldering. These switches are available in 2 through 10 even numbered positions.

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	4	390236-2	2 position DIP switch assembly
	4	390236-8	8 position DIP switch assembly
2	4	390236-2	2 position DIP switch assembly
	4	390236-8	8 position DIP switch assembly
3	4	390236-2	2 position DIP switch assembly
	4	390236-8	8 position DIP switch assembly
4	4	390236-2	2 position DIP switch assembly
	4	390236-8	8 position DIP switch assembly
5	4	390236-2	2 position DIP switch assembly
	4	390236-8	8 position DIP switch assembly

Figure 1

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	1,7	1,5	1,8	1,3
Dry circuit resistance	3,7	2,4	2,4		
Insulation resistance				2,6	
Dielectric withstanding voltage				3,7	
Temperature rise vs current		6(c)			
Capacitance		5			
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 1.5.

(b) Numbers indicate sequence in which tests are performed.

(c) Test only 1 DIP switch connector, 100% energized.

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. A Certificate of Conformance was issued by the Product Assurance Department. Where specified, samples were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Dry Circuit Resistance - Test Groups 1, 2 and 3

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

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. Temperature Rise vs Current - Test Group 2

All samples had a temperature rise of less than 10°C above ambient when tested using a baseline rated current of 140 milliamperes/24 Vdc.

2.6. Capacitance - Test Group 2

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

2.7. Vibration - Test Group 1

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

2.8. 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.

2.9. Durability - Test Group 1

No physical damage occurred to the samples as a result of actuating the samples 7000 times.

2.10. 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 expose to soldering heat.

2.11. Actuation Force - Test Group 1

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

2.12. Thermal Shock - Test Group 4

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

2.13. Humidity-temperature Cycling - Test Group 4

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

2.14. Temperature Life - Test Group 2

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

2.15. 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. Dry Circuit Resistance

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 3). The test current was maintained at 25 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

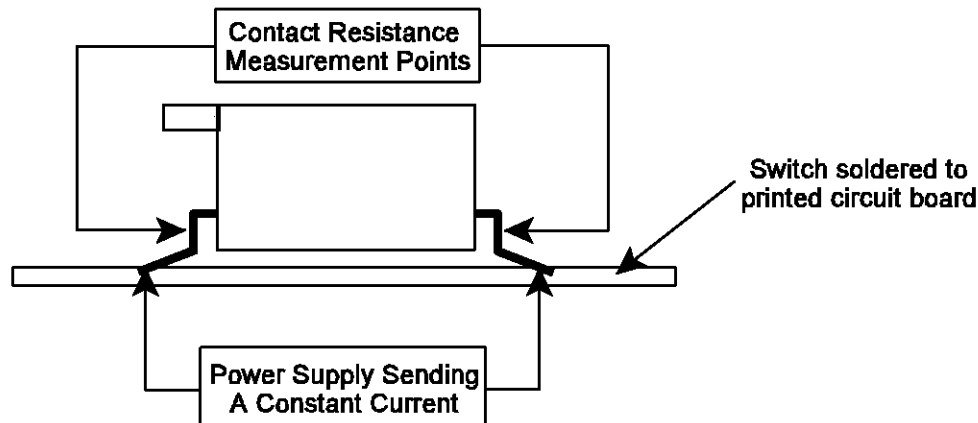


Figure 3
Typical Termination Resistance Measurement Points

3.3. Insulation Resistance

Insulation resistance was measured between adjacent switch contacts in the ON and OFF positions. A test voltage of 500 Vdc was applied for 1 minute before the resistance was measured.

3.4. Dielectric Withstanding Voltage

A test potential of 500 Vdc was applied between adjacent contacts in the ON and OFF position. This potential was applied for 1 minute and then returned to zero.

3.5. Temperature Rise vs Current

Temperature rise curves were produced by measuring individual contact temperatures at 140 milliamperes/24 Vdc with thermocouples attached to individual contacts to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1°C, the temperature measurement was recorded.

3.6. Capacitance

Capacitance was measured between closed switch contacts using a test frequency of 100 kHz.

3.7. Vibration, Random

Samples 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 G²/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.02 G²/Hz at 14 Hz. The spectrum was flat at 0.02 G²/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.

3.8. Mechanical Shock, Half-sine

Mated samples were subjected to a mechanical shock test having a half-sine waveform of 25 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.

3.9. Durability

Samples were actuated 7000 times at a maximum rate of 600 cycles per hour.

3.10. Resistance to Soldering Heat

Samples in the OFF position were subjected to 255°C for 30 seconds.

3.11. Actuation Force

All positions in the sample were actuated by pushing the actuator from the OFF to the ON position at a maximum rate of 0.5 inch per minute.

3.12. Thermal Shock

Samples in the OFF position were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 85°C. The transition between temperatures was less than 1 minute.

3.13. Humidity-temperature Cycling

Samples 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 4).

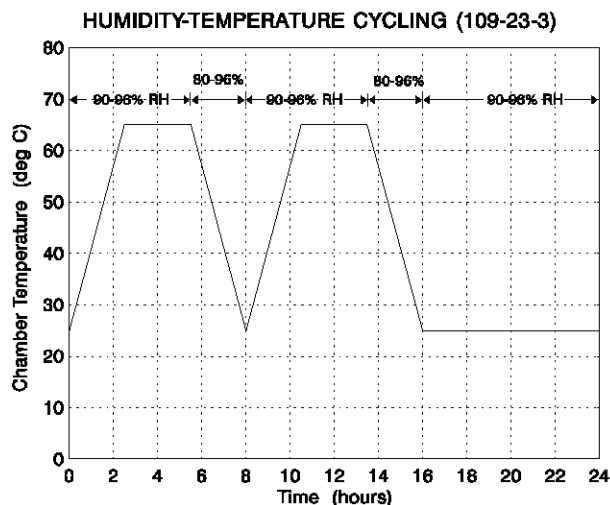


Figure 4
Typical Humidity-Temperature Cycling Profile

3.14. Temperature Life

Samples in the ON position were exposed to a temperature of 85°C for 1000 hours. Samples were preconditioned with 10 cycles of durability.

3.15. Mixed Flowing Gas, Class II

Samples 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 Cl₂ at 10 ppb, NO₂ at 200 ppb, and H₂S at 10 ppb. Samples were preconditioned with 10 cycles of durability.