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PERFORMANCE SPECIFICATION

SWITCHES, DUAL IN-LINE PACKAGE (DIP) GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for dual in-line package (DIP) switches designed for direct insertion into printed circuit boards, plug in sockets components, and panel boards primarily for use in electronic and communications equipment (see 6.1).

1.2 Classification.

1.2.1 Style. The style is identified by the four letter symbol, DIPS, followed by a two digit number. The letters identify low current, low voltage, dual in-line switches. The number identifies the design, indicating the basic physical, mechanical, and electrical characteristics of the switch, for example DIPS 02 (see 3.1).

2. APPLICABLE DOCUMENTS.

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: VAM, Post Office Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A
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FSC 5930

STANDARDS

DEPARTMENT OF DEFENSE

- MIL-STD-202 - Electronic and Electrical Component Parts, Test Methods for.
- MIL-STD-1285 - Marking of Electrical and Electronic Parts.

(See supplement 1 for list of specification sheets.)

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Defense Printing Service Detachment Office Building 4D, Customer Service, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI/EIA RS-448-2 - Test Standard for Electromechanical Components Environmental Effects of Machine Soldering.
- ANSI/NCSL Z540-1 - General Requirements for Calibration Laboratories and Measuring and Test Equipment.
- ANSI/J-STD-004 - Requirements for Soldering Fluxes.

(Applications for copies should be addressed to the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036-8002, telephone 212-642-4900, fax 212-302-1286.)

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

- ISO 10012-1 - Quality Assurance Requirements for Measuring Equipment - Part 1.

(Applications for copies should be addressed to the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036-8002, telephone 212-642-4900, fax 212-302-1286.)

UNDERWRITERS' LABORATORIES (UL), INC.

- UL94 VO - Test for Flammability of Plastic Materials for Parts in Devices and Appliances.

(Application for copies should be addressed to Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. Switches furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.4 and 6.3).

3.3 Material. Material shall be as specified herein. When definite material is not specified, a material shall be used which shall enable the switches to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee of acceptance of the finished product.

3.3.1 Metals. All metal parts, other than current carrying parts, shall be of corrosion resistant material, or shall be suitably plated to resist corrosion.

3.3.2 Plastic. The switch body, actuator, and cover shall be as specified (see 3.1). Molded plastic material shall meet the flammability requirements of UL94 VO. All material shall be inert or fungus resistant.

3.3.3 Protective treatment. Protective coatings and finishes that crack, chip, or scale with age, or extremes of climate and environmental conditions shall not be used.

3.3.4 Plating. Gold plating, when used, shall be equivalent to or better than a minimum of 10 millionths of an inch thick in the contact area over a diffusion barrier. Gold-plated terminals are intended for use in socketed applications and are not recommended for direct insertion and soldering into printed circuit boards. For additional guidance on gold plating see 6.8.

3.3.5 Tin plated finishes. Use of pure tin plating is prohibited (see 6.7). Use of tin-lead (Sn-Pb) finishes are acceptable provided that the minimum lead content is 3 percent.

3.4 Interface and dimensions. Switches shall be of the design, construction, and physical dimensions specified (see 3.1). Switches shall be so constructed as to insure proper operation when mounted in any position.

3.4.1 Terminals. Unless otherwise specified (see 3.1), terminals shall be of the printed circuit type.

3.4.1.1 Plug-in terminations (not applicable to printed circuit boards). Terminals for plug in terminations shall be gold plated. For additional guidance on gold plating see 6.9.

3.4.2 Actuators. Circuit condition indicators shall be as specified (see 3.1). The operating rockers, levers, and slides shall have a color which contrasts with the top housing surface, and shall be constructed of insulating material.

3.4.3 Indexing. Switches shall have a positive detent or indexing mechanism, locating each switching position, except momentary action position. The positive detent or indexing mechanism shall be designed to minimize the possibility of the movable element or elements coming to rest between positions.

3.4.4 Mounting. Switch mounting shall be as specified (see 3.1). The switch body shall be provided with bosses so that a minimum of 0.020 inch clearance is maintained between the mounting board and switch housing.

3.4.4 Orientation. A visual orientation feature shall be incorporated in each switch to assist correct mounting, including identification of terminal number 1 (see 3.1).

3.4.5 Tape top seals. Unless otherwise specified (see 3.1), temporary tape top seals shall be provided for the protection of the switch during equipment assembly and cleaning. Switches with tape top seals shall be supplied with contacts in the closed position and seals in place.

3.4.6 Terminal sealing. Sealing of the switch terminals shall be controlled to preclude meniscus on the terminal leads. Unless otherwise specified (see 3.1), there shall be no meniscus on the switch leads from the terminal potting/sealing material within 0.010 inch the end of the solder standoffs.

3.5 Performance.

3.5.1 Circuit configuration. When switches are tested as specified in 4.8.2, the switch circuit configuration shall conform to the applicable diagram specified (see 3.1). Switches shall make and break the required circuit in all positions of all stations.

3.5.2 Operating force. When switches are tested as specified in 4.8.3, the operating force shall be as specified (see 3.1).

3.5.3 Strength of actuating means. When switches are tested as specified in 4.8.4, there shall be no damage to the contacts, or evidence of broken, loosened, deformed, or damaged parts.

3.5.4 Terminal strength. When switches are tested as specified in 4.8.5, the terminals shall withstand the load without breaking, loosening, or distorting outside dimensional limits.

3.5.5 Switch resistance. When switches are tested as specified in 4.8.6, the switch resistance shall not exceed 50 milliohms.

3.5.6 Thermal shock. When switches are tested as specified 4.8.7, there shall be no evidence of cracking or crazing of the case and the switches shall be mechanically and electrically operable following the test.

3.5.7 Life, low level switching. When switches are tested as specified in 4.8.8, they shall be electrically and mechanically operative during and after the test. There shall be no evidence of broken, loosened, deformed, or displaced parts. Following the unmonitored portion and also during the monitored portion of the test, the switch resistance shall be:

- a. 100 milliohms maximum for closed contacts.
- b. 100,000 ohms minimum for open contacts.

3.5.8 Vibration, high frequency. Unless otherwise specified (see 3.1), when switches are tested as specified in 4.8.9, there shall be no opening of closed contacts or closing of opened contacts in excess of 10 microseconds, and there shall be no evidence of broken, loosened, deformed, or displaced parts.

3.5.9 Shock (specified pulse). Unless otherwise specified (see 3.1), when switches are tested as specified in 4.8.10, there shall be no opening of closed contacts or closing of opened contacts in excess of 10 microseconds, and there shall be no evidence of broken, loosened, deformed, or displaced parts.

3.5.10 Dielectric withstanding voltage. When switches are tested as specified in 4.8.11, there shall be no arcing, flashover, breakdown of insulation, or damage, and the leakage current shall be no greater than 1.0 milliamperes.

3.5.11 Terminal flux sealing. Switches shall have sealed bases to prevent solder flux from entering the contact area. Any evidence of flux in the contact area when tested in accordance with 4.8.12, shall be cause for failure.

3.5.12 Insulation resistance. When switches are tested as specified in 4.8.13, the insulation resistance shall be not less than 1,000 megohms.

3.5.13 Moisture resistance. When switches are tested as specified in 4.8.14, there shall be no evidence of corrosion, breaking, cracking, spalling, or loosening of terminals outside the confines of the terminal anchoring device and the insulation resistance shall be no less than 10 megohms. At the end of the drying period:

- a. Insulation resistance shall be no less than 1,000 megohms.
- b. Dielectric withstanding voltage shall be as specified in 3.5.10.

3.5.14 Capacitance. Unless otherwise specified (see 3.1), when switches are tested as specified in 4.8.15, the capacitance shall be 2 picofarads maximum.

3.5.15 Solderability. When switches with terminals intended for direct insertion and soldering into printed circuit boards are tested as specified in 4.8.16, there shall be no evidence of broken, loosened, deformed, or displaced parts. The criteria for acceptable solderability shall be in accordance with MIL-STD-202, method 208. Unless otherwise specified (see 3.1), there shall be a minimum 0.010 inch clearance between the end of the solder standoff and any sealing potting/epoxy on the pins.

3.5.16 Resistance to soldering heat. Unless otherwise specified (see 3.1), when switches are tested as specified in 4.8.17, the switch resistance shall be as specified in 3.5.5, and there shall be no deformation or other damage at the conclusion of the test sequence.

3.5.17 Resistance to solvents. When switches are tested as specified in 4.8.18, the markings shall be legible.

3.5.18 Machine soldering. When switches with terminals intended for direct insertion and soldering into printed circuit boards are tested as specified in 4.8.19, there shall be good solder connections, no externally visible indication of leakage, loosened, or deformed parts. All markings shall be readily visible, and there shall be no mechanical or electrical damage.

3.6 Marking. Switches shall be marked in accordance with MIL-STD-1285 and shall include the military Part or Identifying Number (PIN) (see 6.5 and 3.1), the manufacturer's name or code symbol, date code, actuator identification, and orientation (see 3.1 and 3.4.4).

3.6.1 Actuator identification. Switch actuator shall be marked with characters, visible from the top of switch.

3.7 Workmanship. Switches shall be processed in such a manner as to be uniform in quality and shall be free from flash, crazing, cracks, voids, pimples, chips, blisters, pinholes, and other defects that will adversely affect life, serviceability, or appearance.

4. VERIFICATION.

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4)
- b. Conformance inspection (see 4.6)
- c. Periodic inspection (see 4.7)

4.2 Test equipment and inspection facilities. The supplier shall establish and maintain a calibration system in accordance with ANSI/NCSL Z540-1, ISO 10012-1, or equivalent system as approved by the qualifying activity.

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the "General Requirements" of MIL-STD-202.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3).

4.4.1 Test routine. Sample units shall be subjected to the qualification inspections specified in table I, in the order shown.

4.4.2 Failure. Failure in any inspections or tests shall be cause for refusal to grant qualification.

4.4.3 Extent of qualification. Qualification shall be extended to all switches covered by a specification sheet that contain a fewer number of stations than the samples which have met the requirements as specified. When qualifying with different terminal finish, three additional sample units shall be subjected to group I and group IV, providing the terminal finish is the only difference. When qualification of switches with different switching characteristics (such as spring return and momentary actions) is requested, the test sample specified in table I shall consist of equal numbers of each switch characteristic.

4.5 Verification of qualification. Every 12 months the manufacturer shall provide verification of qualification to the qualifying activity. Continuation is based on meeting the following requirements:

- a. Design of switch has not been modified.
- b. Verification of group A lot acceptance.
- c. Periodic group B inspection.

4.6 Conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection.

4.6.1.1 Inspection lots. An inspection lot shall consist of all switches of the same type produced under essentially the same conditions and offered for inspection at one time.

4.6.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table II, in the order shown.

4.6.1.2.1 Sampling plan. Statistical sampling shall be in accordance with table III. For acceptance, there shall be zero occurrences of defects.

4.6.1.2.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units. The lot shall then be sampled as specified in table III. For acceptance, there shall be zero occurrences of defects. Such lots shall be separated from new lots and shall be clearly identified as reinspected lots. If any defects are found in this second sample, the lot shall be rejected and shall not be supplied to this specification.

4.7 Periodic inspection. Periodic inspection shall consist of group B. Except where the results of these inspections show noncompliance with the applicable requirements (see 4.7.2), delivery of the products which have passed group A shall not be delayed pending the results of these periodic inspections.

4.7.1 Group B inspection. Group B inspection shall consist of the inspections specified in table I, in the order shown. When a manufacturer has similar products qualified under different specification sheets, the qualifying activity may authorize group B tests which do not require redundant testing on the similar features of these products. A manufacturer's normal quality control tests, production tests, environmental tests, and so forth may be used to fulfill all or part of group B inspection.

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4.7.1.1 Sampling plan. Group B inspection shall be completed in accordance with table I within 36 months after the date of notification of qualification and within each subsequent 36-month period. The sample shall be selected either from stock or a current production lot. Switches selected from stock shall have been produced after the date of notification of qualification or subsequent to the date code of the previous group B inspection sample units.

4.7.1.2 Failures. If one or more sample units fail to pass group B inspection, the sample shall be considered to have failed.

4.7.1.3 Disposition of sample units. Sample units subjected to group B inspection shall not be delivered on a contract, however, they shall be forwarded to the qualifying activity.

4.7.2 Noncompliance. If a sample fails to pass group B inspection, the contractor shall take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc., and which are considered subject to the same failures. Acceptance of the product shall be discontinued until corrective action, acceptable to the qualifying activity, has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspections or the inspection which the original sample failed, at the option of the qualifying activity). Final acceptance shall be withheld until the group B reinspection has shown that the corrective action was successful.

4.8 Methods of examination and test.

4.8.1 Visual and mechanical examination. Switches shall be examined to verify that the dimensions, materials, design, construction, marking, and workmanship are in accordance with applicable requirements (see 3.1, 3.3, 3.4, 3.6 and 3.7).

4.8.2 Circuit configuration (see 3.5.1). Switches shall be tested to determine conformance to actual open and closed switch circuit condition by using a suitable test circuit. The test circuit shall not employ current levels that can adversely affect low level switching capabilities.

4.8.3 Operating force (see 3.5.2). Switches shall be mounted in a suitable manner and the values of operating force required to actuate the switch in both directions (open and closed positions) shall be determined. Measurement of the operating force of the switches with slide actuation shall be made with the measuring device operated parallel to the normal actuation plane of the slide. All readings shall be within the value specified (see 3.1).

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TABLE I. Qualification and group B inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of sample units to be tested
<u>Group I 1/</u>			
Visual and mechanical examination	3.1, 3.3, 3.4, 3.6, and 3.7	4.8.1	All samples
Circuit configuration	3.5.1	4.8.2	
Operating force	3.5.2	4.8.3	
Strength of actuation means	3.5.3	4.8.4	
Terminal strength	3.5.4	4.8.5	
Switch resistance	3.5.5	4.8.6	
<u>Group II</u>			
Thermal shock	3.5.6	4.8.7	3 samples (one for each electrical load)
Life, low level switching	3.5.7	4.8.8	
Switch resistance	3.5.5	4.8.6	
Operating force	3.5.2	4.8.3	
Strength of actuating means	3.5.3	4.8.4	
Vibration, high frequency	3.5.8	4.8.9	
Shock (specified pulse)	3.5.9	4.8.10	
Switch resistance	3.5.5	4.8.6	
Dielectric withstanding voltage	3.5.10	4.8.11	
Insulation resistance	3.5.12	4.8.13	
<u>Group III</u>			
Moisture resistance	3.5.13	4.8.14	3 samples
Insulation resistance	3.5.12	4.8.13	
Dielectric withstanding voltage	3.5.10	4.8.11	
Switch resistance	3.5.5	4.8.6	
Terminal flux sealing	3.5.11	4.8.12	
<u>Group IV</u>			
Capacitance	3.5.14	4.8.15	3 samples
Solderability 2/	3.5.15	4.8.16	
Resistance to soldering heat	3.5.16	4.8.17	
Switch resistance	3.5.5	4.8.6	
Dielectric withstanding voltage	3.5.10	4.8.11	
Resistance to solvents	3.5.17	4.8.18	
<u>Group V 3/ 4/</u>			
Machine soldering 2/	3.5.18	4.8.19	8 samples
Circuit configuration	3.5.1	4.8.2	
Operating force	3.5.2	4.8.3	
Strength of actuating means	3.5.3	4.8.4	
Switch resistance	3.5.5	4.8.6	
Insulation resistance	3.5.12	4.8.13	

1/ Two sample units only for physical dimension and terminal strength.

2/ Applicable to switches with terminals intended for direct insertion and soldering into printed circuit boards.

3/ Two samples for each of the two cleaning solutions for immersion testing, and an equal number for the cleaning solutions used for spray cleaning.

4/ Group I tests are not required for group V samples.

TABLE II. Group A inspection.

Inspection <u>1/</u>	Requirement paragraph	Method paragraph
Visual and mechanical examination <u>2/</u>	3.1, 3.3, 3.4, 3.6, and 3.7	4.8.1
Circuit configuration	3.5.1	4.8.2
Switch resistance	3.5.5	4.8.6
Dielectric withstanding voltage <u>3/</u>	3.5.10	4.8.11

1/ Switches with tape top seals shall be tested with contacts in the closed position and seals in place.

2/ Measurement of physical dimensions not required.

3/ Dielectric withstanding voltage measurement will be made between adjacent poles only.

TABLE III. Zero defect sampling plan.

Lot size	Number of switches to be tested		
	Major <u>1/</u>	Minor <u>1/</u>	Cosmetic <u>1/</u>
1 - 8	All	5	3
9 - 15	13	5	3
16 - 25	13	5	3
26 - 50	13	5	5
51 - 90	13	7	6
91 - 150	13	11	7
151 - 280	20	13	10
281 - 500	29	16	11
501 - 1,200	34	19	15
1,201 - 3,200	42	23	18
3,201 - 10,000	50	29	22
10,001 - 35,000	60	35	29

1/ Major, minor, and cosmetic defects are defined in section 6. Inspection for minor and cosmetic defects is applicable to visual and mechanical examination only.

4.8.4 Strength of actuating means (see 3.5.3). The switches shall operate mechanically and electrically at rated resistive load for the lowest dc voltage (see 3.1), for ten cycles of operations after the following tests, as applicable:

- a. Rocker switches. A force of 50 percent greater than the maximum specified operating force (see 3.1), shall be applied to the actuator and maintained for 1 minute. The force applied shall be applied perpendicular to the actuator, resting upon the stop, first in the open position, then against the stop in the closed position.
- b. Slide and lever switches. A force of 50 percent greater than the maximum specified operating force (see 3.1), shall be applied to the actuator and maintained for 1 minute under the following conditions, where applicable:
 - (1) Perpendicular to the actuator axis and parallel to the line of actuator travel at each end position of the actuator.
 - (2) Perpendicular to the actuator axis and perpendicular to the line of travel at each actuator position.
 - (3) Coaxial with the actuator axis away from the actuator pivot throughout the entire range of actuator travel.
 - (4) Coaxial with the actuator axis and toward the actuator pivot throughout the entire range of actuator travel.

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4.8.5 Terminal strength (see 3.5.4). Half of the terminals (not to exceed six terminals) on each switch shall be tested. Two of the terminals shall be of the same station. Unless otherwise specified (see 3.1), both a pull force of 1 pound and a push force of 0.5 pound shall be exerted gradually to each terminal for 15 seconds in a direction along the longitudinal axis of the terminal. The force shall be applied to the terminal at the location for connection.

4.8.6 Switch resistance (see 3.5.5). Switches shall be tested in accordance with method 307 of MIL-STD-202. The following details and exceptions shall apply:

- a. Method of connection: Affix test probes to switch leads or printed circuit pads by clips or solder.
- b. Number of contacts to be tested: Up to a total of six different pairs of mating contacts on each specimen, evenly divided between normally open and normally closed, if applicable.
- c. Test current: 10 milliamperes maximum.
- d. Maximum open circuit test voltage: 50 millivolts.
- e. Number of activations prior to measurement: Four.
- f. Number of test activations: One for each mating contact under test.
- g. Number of measurements per activation: One for each pair of mating contacts under test.

4.8.7 Thermal shock (see 3.5.6). Switches shall be tested in accordance with method 107 of MIL-STD-202. The following details shall apply:

- a. Test condition: A, except upper temperature limit shall be 85°C.
- b. Measurement before and after cycling: Not applicable.
- c. Examination after test: The switches shall be examined for mechanical and electrical damage, and loosening of rivets and other fastening devices.

4.8.8 Life, low level switching (see 3.5.7). Switches shall be tested in accordance with method 311 of MIL-STD-202. The following details and exceptions shall apply:

- a. Number of cycles and cycling rate: Not less than 2,000 cycles unmonitored followed by 10 cycles monitored at a rate not to exceed 10 cycles per minute.
- b. All mating contacts of each switch shall be tested. Test voltage and current for cycling, monitoring, and switch resistance measurements:
 - (1) Sample 1: 50 millivolts dc maximum, at 10 milliamperes maximum.
 - (2) Sample 2: 6 volts dc ± 0.5 volts dc at 100 milliamperes ± 10 milliamperes.
 - (3) Sample 3: 24 volts dc ± 2 volts dc at 25 milliamperes ± 10 percent.
- c. At conclusion of 2,000 cycles of unmonitored switch operation, the switch resistance shall be measured.
- d. During the 10 cycles of monitored switch operation, the switch resistance shall be measured after each cycle.
- e. Examination after test: The switches shall be examined for evidence of broken, loosened, deformed, or displaced parts.

4.8.9 Vibration, high frequency (see 3.5.8). Switches shall be tested in accordance with method 204 of MIL-STD-202, and all contacts shall be continuously monitored in accordance with method 310 of MIL-STD-202. The following details and exceptions shall apply:

- a. **Mounting:** Unless otherwise specified (see 3.1), switches shall be mounted to the vibration equipment by means of their terminals.
- b. Each switch shall be preset with half its mating contacts in the open position and the other half in the closed position.
- c. Test condition letter: B.
- d. **Direction of motion:**
 - (1) Parallel to the longitudinal axis of the switch;
 - (2) Parallel to the terminals; and
 - (3) Mutually perpendicular to 4.8.9.d(1) and 4.8.9.d(2), and parallel to the mounting plane.
- e. **Multi-contact interconnection** is at the option of the manufacturer. All or any part(s) of the closed contacts in the sample may be connected in series, and all or part of the open contacts may be connected in parallel. If there is an indication of failure with contacts connected in accordance with this option, the vibration cycle may be continued with contacts reconnected and monitored switch by switch or station by station. If there is no indication of failure under these reestablished conditions, the original indication of failure may be ignored.
- f. **Examination after test:** Switches shall be examined for evidence of broken, loosened, deformed, or displaced parts.

4.8.10 Shock (specified pulse) (see 3.5.9). Switches shall be tested in accordance with method 213 of MIL-STD-202 and all contacts shall be continuously monitored in accordance with method 310 of MIL-STD-202. The following details and exceptions shall apply:

- a. **Mounting:** Unless otherwise specified (see 3.1), switches shall be mounted to the shock test equipment by means of their terminals.
- b. Test condition letter: A.
- c. **Monitoring during shock:** Each switch shall be preset with half its mating contacts in the open position and the other half in the closed position. At the option of the manufacturer, all or any part(s) of the closed contacts in the sample may be connected in series, and all or any part of the open contacts may be connected in parallel. If a failure is indicated with contacts connected in accordance with this option, the shock test may be repeated with contacts reconnected and monitored switch by switch or station by station. If there is no indication of failure under these reestablished conditions, the original indication of failure may be ignored.
- d. **Examination after test:** Switches shall be examined for evidence of broken, loosened, deformed, or displaced parts.

4.8.11 Dielectric withstanding voltage (see 3.5.10). Switches shall be tested in accordance with method 301 of MIL-STD-202. The following details and exceptions shall apply:

- a. Preparation: Mounted by suitable means.
- b. Magnitude of test voltage: 500 volts.
- c. Nature of potential: AC.
- d. Points of application of test voltage: Test one half of the switches between open contact and the remainder between adjacent closed contacts.
- e. Method of connection of test voltage to specimen: Affix probes to switch leads or printed circuit board circuit pads by clips or solder.
- f. Examination after test: Switches shall be examined for evidence of arcing, flashover, breakdown of insulation, and damage.

4.8.12 Terminal flux sealing (see 3.5.11). Switches shall be tested as follows: For each switch station, measure and record initial contact resistance and force required to operate. Place switches, terminal down, into shallow pan. Pour flux, in accordance with type symbol B of ANSI/J-STD-004, specific gravity 0.896, at 80°F ±5°F, into a pan without splashing until level of flux is approximately .625 inch above bottom of the plastic switch case, and let switches soak for 10 minutes. Remove switches from flux and immediately place into oven for drying at 175°F ±10°F for two hours. After switches have cooled to room temperature, visually examine the actuator area for evidence of flux and repeat initial measurements. Contact resistance shall not increase by more than 10 milliohms over initial readings. Operating force shall not increase more than 10 percent over the initial recorded operating force.

4.8.13 Insulation resistance (see 3.5.12). Switches shall be tested in accordance with method 302 of MIL-STD-202. The following details and exceptions shall apply:

- a. Test condition letter: A.
- b. Points of measurement: One half of the switches shall be tested between open contacts and the remainder between adjacent closed contacts.

4.8.14 Moisture resistance (see 3.5.13). Switches shall be tested in accordance with method 106 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting: Switches shall be mounted by suitable means.
- b. Initial measurements: Not applicable.
- c. Polarization: During steps 1 to 6 inclusive, a polarization voltage of 50 volts dc shall be applied between all terminals associated with each of two adjacent poles.
- d. Steps 7a and 7b are not applicable.
- e. Load voltage: Not applicable.

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- f. Final measurement: Within two hours after the test and within five minutes of removing the switches from the humidity chamber, insulation resistance shall be measured as specified in 4.8.13.
- g. Measurements after test: At the end of the drying period, dielectric withstanding voltage and insulation resistance shall be measured as specified in 4.8.11 and 4.8.13, respectively.
- h. Examination after test: The switches shall be examined for evidence of corrosion, breaking, cracking, spalling, or loosening of terminals. A movement of the terminal within the confines of the terminal's anchoring device shall be permitted provided continuity of electrical contact is not impaired.

4.8.15 Capacitance (see 3.5.14). Switches shall be tested in accordance with method 305 of MIL-STD-202. The following details and exceptions shall apply:

- a. Measurement frequency: Unless otherwise specified (see 3.1), 1,000 kHz.
- b. Measurement accuracy: The greater of 2 percent or 0.2 picofarad.
- c. Points of measurement: Test one half of the switches between open contacts and the remainder between adjacent closed contacts.

4.8.16 Solderability (see 3.5.15). Switches shall be tested in accordance with method 208 of MIL-STD-202. Half of the terminals shall be tested.

4.8.17 Resistance to soldering heat (see 3.5.16). Switches shall be tested in accordance with method 210 of MIL-STD-202. The following details and exceptions shall apply:

- a. The use of heat sinks or shielding is prohibited except when they are part of the component.
- b. Number of contacts to be tested: Up to a total of six different pairs of mating contacts on each specimen, evenly divided between normally open and normally closed, if applicable.
- c. Test condition letter: C.
- d. Cooling time: Optional with contractor.
- e. Measurement and inspection after test: The switch resistance shall be measured as specified in 4.8.6. The switches shall be inspected for deformation or other damage.

4.8.18 Resistance to solvents (see 3.5.17). Switches shall be tested in accordance with method 215 of MIL-STD-202. The following details and exceptions shall apply:

- a. Portion to be brushed: All marking areas.
- b. Number of specimen to be tested: Three.
- c. Extent of mechanical or electrical damage: Not applicable.

4.8.19 Machine soldering (see 3.5.18). Switches shall be tested in accordance with method 16 of ANSI/EIA RS-448-2. Fluxing method A (touching body) shall be used; solder time shall be 4 seconds; and cleaning shall be accomplished by immersion and spray, using isopropyl alcohol and deionized water/detergent only. Switches with tape top seal shall be tested with seal in place.

5. PACKAGING.

5.1 **Packaging.** For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES.

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 **Intended use.** Switches covered by this specification are intended for use in low power dc applications. Also, these switches are intended for use on printed circuit boards, and leads may be soldered or inserted in plug-in sockets. When switches and plug-in sockets are used together, they should have similar or compatible contact finishes. These switches military unique due to the fact that these devices must be able to operate satisfactorily in military systems under the following demanding conditions: 15 Gs of vibration, 50 Gs of shock. In addition these military requirements are verified under a qualification system. Commercial components are not designed to withstand these military environmental conditions.

NOTE: Fluxes and cleaning solutions which are allowed to enter DIP switches can be injurious to reliable switch operation unless they can be thoroughly rinsed in clean solutions. DIP switches are made with thermoplastic materials which can be damaged through excessive preheating, soldering temperature, and time durations. Manufacturing assembly operations should consider these factors.

6.2 **Acquisition requirements.** Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Title, number, and date of the applicable specification sheet and the complete PIN (see 3.1 and 6.5).
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- d. Packaging requirements (see 5.1).

6.3 **Qualification.** With respect to the products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL-83504 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Defense Supply Center Columbus, ATTN: DSCC-VQP, Columbus, OH 43216-5000 and information pertaining to qualification of products may be obtained from that activity.

6.3.1 **Provisions Governing Qualification.** Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Defense Printing Service Detachment Office, Building 4D, Customer Service, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.4 **Definitions.**

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6.4.1 Dual in-line package (DIP) switch. A switch which is a miniature high density switch for easy printed circuit board mounting, consisting of individual switch stations.

6.4.2 Switch stations. A switch station is the section containing the electrical circuitry, including the actuator. The switch station is operated with a rocker, toggle, or slide actuator.

6.4.3 Sealed base switch. A switch in which the contact mechanism is neither visible nor accessible through openings in the envelope. The sealing is obtained when the base is sealed to prevent flux from entering the switch case during the machine soldering process.

6.4.4 Open base switch. A switch in which the contact mechanism is visible or accessible, or both, through openings in the envelope.

6.4.5 Closed base switch. A switch in which the contact mechanism is neither visible or accessible through openings in the envelope.

6.4.6 Major defect. A defect that could result in a failure or that will reduce the usability of the switch for its intended purpose.

6.4.7 Minor defect. A defect that is not likely to reduce the usability of the switch for its intended purpose. It may be a departure from established standards having no significant bearing on the effective use or operation of the switch.

6.4.8 Cosmetic defect. A variation from the conventional appearance of an item, such as a slight change in its usual color.

6.5 Part or Identifying Number (PIN). The PIN to be used for switches acquired to this specification are created as follows:

<u> M </u>	<u> 83504/XX </u>	<u> -XXX </u>
Prefix to indicate military specification	Specification sheet number	Dash number (see specification sheet)

6.6 Subject term (key word) listing.

- Low profile
- Machine insertable
- Recessed rocker
- Recessed slide rocker
- Side toggle
- Slide rocker

6.7 Tin plated finishes. Use of tin plating is prohibited (see 3.3.5). Use of tin finishes can result in the tin whisker growth. Tin whisker growth can result in adverse effects on the operation of electronic equipment systems. For additional information on this matter, refer to ASTM B545-83 (Standard Specification for Electrodeposited Coating of Tin).

6.8 Gold Plating. Based on previous experience, gold plating in accordance with MIL-G-45204 (type II, grade C) has been used successfully to meet the requirements of this specification.

6.10 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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Custodians:
Army - CR
Navy - EC
Air Force - 85

Preparing activity:
DLA - CC

(Project 5930-1618)

Review activities:
Army - AR, AV, MI
Navy - AS
Air Force - 99

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-83504B	2. DOCUMENT DATE (YYMMDD) 97/06/10
3. DOCUMENT TITLE SWITCHES, DUAL IN-LINE PACKAGE (DIP), GENERAL SPECIFICATION FOR		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (incl Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME Defense Supply Center Columbus ATTN: DSCC/VAM	b. TELEPHONE (Include Area Code) (1) Commercial (614) 692-0551 (2) AUTOVON 850-0551	
c. ADDRESS (Include Zip Code) Post Office Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5803 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	