NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. The document identifier on subsequent pages has not been changed, but will be changed the next time this document is revised.

INCH-POUND

MIL-PRF-83401F
AMENDMENT 4
26 November 1993
SUPERSEDING
AMENDMENT 3
11 June 1993

PERFORMANCE SPECIFICATION

RESISTOR NETWORKS, FIXED, FILM,
AND CAPACITOR-RESISTOR NETWORKS, CERAMIC CAPACITOR
AND FIXED FILM RESISTORS, GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-R-83401F, dated 9 October 1989, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 2

TABLE I, "Tracking to the reference element" entry, column 2: Delete "±1" and substitute "±5".

* TABLE I, "Low temperature operation" entry, characteristic "Y": Delete "±.02" and substitute "±.01".

PAGE 3

TABLE I, "Vibration, high frequency" entry, symbol "V": Delete "±0.3" and substitute "±0.03". (Corrects an entry made in amendment 1.)

PAGE 6

Following table IV, add:

" TABLE IVa. Resistance 10 to 100 decade values which are inactive for new design as of 9 March 1987.

Resistance tolerance
F (1.0)
12.00
16.00
47.00

"

PAGE 7

TABLE V, delete in its entirety and substitute:

" TABLE V. Resistance and ratio tolerance.

Symbol	Resistance tolerance percent	Ratio tolerance percent	Applicable characteristic
V	0.005	0.005	Y
T	0.01	0.01	Y
A	0.05	0.05	R, Y
B	0.1	0.1	C, V, R, Y
D	0.5	0.1	C, V, R, Y
F	1.0	0.5	C, V, R, Y
G	2.0		
J	5.0		
X 1/			

1/ The X tolerance shall be as specified in the detail specification. "

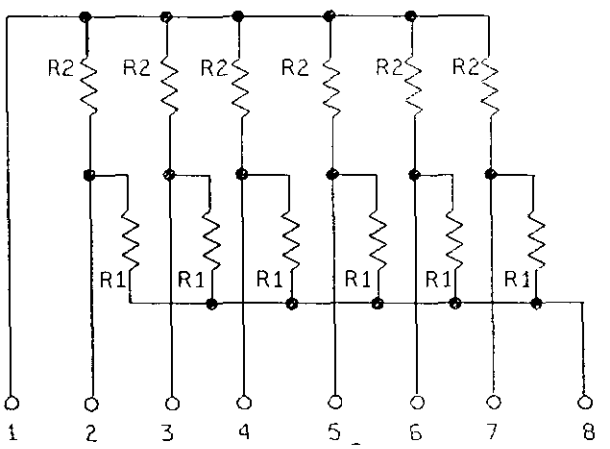
PAGE 8

Under STANDARDS, MILITARY, following MIL-STD-810, add:

"MIL-STD-1276 - Leads for Electronic Component Parts."

PAGE 10

FIGURE 1, schematic "H", delete and substitute:



SCHEMATIC "H"

Following 3.4.5, add:

"3.4.5.1 Bonding. If thermo-compression bonding is used for internal connections, a gold bond shall form a solid phase weld (see 3.1)."

3.4.6, 3.4.6.1, and 3.4.6.2: Delete in their entirety and add the following (alters a change from amendment 2):

"3.4.6 Tin plated finishes. Use of tin plating is prohibited (see 6.4.3.1). Use of tin-lead finishes are acceptable provided that the minimum lead content is 3 percent.

★ "3.4.7. Solder dip (retinning) leads. The manufacturer may solder dip/retin the leads of product supplied to this specification provided the solder dip process has been approved by the qualifying activity. The manufacturer shall maintain a solder purity in accordance with table VIa, during the tinning process.

" TABLE VIa. Contamination limits.

Contamination	Tinning percent by weight 1/
Copper	.75
Gold	.50
Cadmium	.01
Zinc	.008
Aluminum	.008
Antimony	.50
Iron	.02
Arsenic	.03
Bismuth	.25
Silver	.75
Nickel	.025

1/ This is a fixed percentage by weight of the solder.

"3.4.7.1 Qualifying activity approval. Approval of the solder dip process will be based on one of the following options:

a. When the original lead finish qualified was hot solder dip lead finish 52 of MIL-STD-1276.

(NOTE: The 200 microinch thickness is not applicable.) The manufacturer shall use the same solder dip process for retinning as is used in the original manufacture of the product.

b. When the lead originally qualified was not hot solder dip lead finish 52 of MIL-STD-1276 as prescribed in 3.4.6.1a, approval for the process to be used for solder dip shall be based on the following test procedure:

(1) Thirty samples of any resistance value for each style and lead finish are subjected to the manufacturing's solder dip process. Following the solder dip process, the resistors are subject to the direct current resistance test and other group A electricals. No defects are allowed.

(NOTE: If hermetic seal testing is required in group A, these tests would also be performed. No defects are allowed.)

(2) Ten of the 30 samples are then subjected to the solderability test. No defects are allowed.

(3) The remaining 20 samples are subjected to the resistance to solder heat test followed by the moisture resistance test (or hermetic seal test if the device is hermetically sealed). No defects are allowed.

"3.4.7.2 Solder dip/retinning options. The manufacturer (or authorized category B or C distributor) may solder dip/retin as follows:

a. After the 100 percent group A screening tests. Following the solder dip/retinning process, the electrical measurements required in group A, subgroup 1, 100 percent screening tests shall be repeated on 100 percent of the lot. (NOTE: The manufacturer may solder dip/retin prior to the 100 percent electrical measurements of the group A, subgroup 1 tests). The percent defective allowable (PDA) (see 4.5.1.2.1) for the electrical measurements shall be as for the subgroup 1 tests.

b. As a corrective action if the lot fails the group A solderability tests, the lot may be retinned no more than two times. The lot after retinning shall be 100 percent screened for group A electrical requirements (DC resistance) any parts failing (lot not exceeding PDA for group A subgroup 1, see 4.5.1.2.1) these screens shall not be supplied to this specification, if electrical failures are detected after the second retinning operation exceeding 1 percent of the lot, the lot shall not be supplied to this specification.

c. After the group A inspection has been completed. Following the solder dip/retinning process, the electrical measurements required in group A, subgroup 1, 100 percent screening test shall be repeated on 100 percent of the lot. The PDA for the electrical measurements shall be as for the subgroup 1 tests (see 4.5.1.2.1). Following these tests, the manufacturer shall submit the lot to the group A solderability test as specified in 4.6.6. "

PAGE 16

* 3.14, Characteristic C and V: Delete "±.03" and substitute "±.02".

PAGE 19

TABLE IX, delete and substitute:

" TABLE IX. Temperature characteristic substitution.

Temperature characteristic	Acceptable temperature characteristic substitute
H	
K	H
M	H, K

"

PAGE 20

TABLE X, delete and substitute:

"TABLE X. Resistance tolerance substitution.

Resistance tolerance	Resistance tolerance substitute
B	
D	B
F	B, D
G	B, D, F
J	B, D, F, G

"

* TABLE XI, delete and substitute:

" TABLE XI. Qualification inspection.

Inspection	Number of sample units	Requirement paragraph	Method paragraph	Number of 1/ failures allowed
Group I 2/ 3/				
Thermal shock		3.7	4.6.3	
Power conditioning	All sample	3.8	4.6.4	5/
DC resistance	units 4/	3.9	4.6.5	
Hermetic seal (when applicable)		3.10	4.6.21	
Group Ia 3/ 6/				
Visual and mechanical inspection		3.1, 3.3, 3.4 3.27, 3.28	4.6.2	0
Group Ib 7/				
Solderability	5	3.11	4.6.6	1
Group II 7/				
Resistance to solvents		3.12	4.6.7	1
Group III				
Resistance temperature characteristic	20 or 30	3.13	4.6.8	
Low temperature operation	10 high	3.14	4.6.9	
Short time overload	10 critical 8/	3.15	4.6.10	1
Terminal strength	10 low	3.16	4.6.11	
Hermetic seal (when applicable)		3.10	4.6.21	
Group IV				
Thermal shock		3.7	4.6.3	
Dielectric withstanding voltage	20 or 30	3.17	4.6.12	
Insulation resistance	10 high	3.18	4.6.13	
Resistance to soldering heat 9/	10 critical 8/	3.19	4.6.14	1
Moisture resistance	10 low	3.20	4.6.15	
Hermetic seal (when applicable)		3.10	4.6.21	
Group V				
Shock (specified pulse)	20 or 30	3.21	4.6.16	
Vibration, high frequency	10 high	3.22	4.6.17	1
Hermetic seal (when applicable)	10 critical 8/ 10 low	3.10	4.6.21	
Group VI				
Life	20 or 30 10 high 10 critical 8/ 10 low	3.23	4.6.18	0
Group VIa				
25°C power rating	20 or 30 10 high 10 critical 8/ 10 low	3.23.1	4.6.18	1

See footnotes at end of table.

" TABLE XI. Qualification inspection - Continued.

Inspection	Number of sample units	Requirement paragraph	Method paragraph	Number of failures allowed
Group VII High temperature exposure Low temperature storage	20 or 30 10 high 10 critical 8/ 10 low	3.24 3.25	4.6.19 4.6.20	1
Group VIII 4/ 10/ Fungus	10	3.26	4.6.22	0

1/ Failure of a single network in one or more tests of a group shall be charged as a single defective.
2/ Tests need not be performed if group A inspection has been performed on the qualification samples.
3/ Nondestructive tests.
4/ Sample units for group II and VIII are not required to be subjected to group I.
5/ Networks shall meet all requirements of group I before subjecting to groups III through VII.
6/ Marking shall be considered defective if the marking is illegible or incorrect.
7/ Tests may be performed on electrical rejects.
8/ When no critical value is specified, only the highest and lowest resistance values shall be tested (20 samples, total).
9/ The internal visual examination shall be performed after the final inspection of group IV.
10/ The fungus requirement is either by certification or performance."

PAGE 24

* 4.5.1, delete and substitute:

"4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A and group B inspections. Group B inspection for inspection of delivery is not required when the qualifying activity has allowed group B testing to be performed annually."

* TABLE XII, delete and substitute:

" TABLE XII. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of samples
Subgroup 1 Thermal shock Power conditioning DC resistance 1/ Hermetic seal (when applicable)	3.7 3.8 3.9 3.10	4.6.3 4.6.4 4.6.5 4.6.21	100 percent inspection
Subgroup 2 Visual examination	3.1, 3.4, 3.26, 3.27, 3.28	4.6.2	13 samples 0 defects
Subgroup 3 Solderability	3.11	4.6.6	5 samples 0 defects

1/ Networks shall meet the specified initial resistance tolerance. The resistance measurement made upon completion of power conditioning test may be used if a measurement has been made which can, without conversion, be directly related to nominal resistance value and tolerance.

* 4.5.1.2.1, delete and substitute:

"4.5.1.2.1 Sampling plan. Subgroup 1 test shall be performed on 100 percent of the product supplied under this specification. Networks that are out of resistance tolerance, or which experience a change in resistance greater than that permitted for the tests of this subgroup shall be removed from the lot. Lots having more than 10 percent total rejects or 1 unit, whichever is greater, due to exceeding the specified resistance change limit shall not be furnished on contracts. Examples of defects shall be as specified in table XIII."

PAGE 25

TABLE XIII, line 1: Delete "Classification" and substitute "Examples".

* Following 4.5.1.2.1.2, add:

"4.5.1.2.1.3 Subgroup 3 (solderability).

"4.5.1.2.1.3.1 Sampling plan. Five samples shall be selected randomly from each inspection lot and subjected to the subgroup 3 solderability test. The manufacturer may use electrical rejects or empty body network from the subgroup 1 screening tests for all or part of the samples to be used for solderability testing. The empty body networks must be processed through all the standard manufacturing and test flow cycles, oven bakes, and temperature cycles of qualified networks to assure that the network leads and printed surfaces are in the usual condition prior to test. If there is one or more defects, the lot shall be considered to have failed.

"4.5.1.2.1.3.2 Rejected lots. In the event of one or more defects, the inspection lot is rejected. The manufacturer may use one of the following options to rework the lot:

"a. Each production lot that was used to form the failed inspection lot shall be individually submitted to the solderability test as required in 4.5.1.2.1.3.1. Production lots that pass the solderability test are available for shipment. Production lots failing the solderability test can be reworked only if submitted to the solder dip procedure in 4.5.1.2.1.3.2b.

"b. The manufacturer submits the failed lot to a 100 percent solder dip using an approved solder dip process in accordance with 3.4.7. Following the solder dip, the electrical measurements required in group A, subgroup 1, tests shall be repeated on 100 percent of the lot. The PDA for the electrical measurements shall be as for the subgroup 1 tests. (NOTE: If hermetic seal is required in the group A, subgroup 1 tests, these tests shall be repeated). Thirteen additional samples shall then be selected and subjected to the solderability test with zero defects allowed. If the lot fails this solderability test, the lot may be reworked a second time and retested. If the lot fails the second rework, the lot shall be considered rejected and shall not be furnished against the requirements of this specification.

"4.5.1.2.1.3.3 Disposition of samples. The solderability test is considered a destructive test and samples submitted to the solderability test shall not be supplied on the contract. "

* TABLE XIV, delete and substitute:

TABLE XIV. Group B inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of samples
Subgroup 1 1/			
Resistance temperature characteristic	3.13	4.6.8	13
Subgroup 2 1/ 2/			
Resistance to solvents	3.12	4.6.7	8

1/ If the manufacturer can demonstrate that this test has been performed five consecutive times with zero failures, the frequency of this test, with the approval of the qualifying activity, can be performed on an annual basis. If the design, material, construction, or processing of the part is changed, or if there are any quality problems or failures, the qualifying activity may require resumption of the original test frequency.
2/ Tests may be performed on electrical rejects.

4.5.1.3.2, delete and substitute:

"4.5.1.3.2 Subgroup 2. A sample of eight parts shall be randomly selected. If one or more defects are found, the lot shall be reworked to correct the defects or shall be rescreened and defects removed. A new sample of eight parts shall then randomly be selected. If one or more defects are found in this second sample, the lot shall be rejected and shall not be supplied to this specification."

4.5.1.3.3, following line 4, add new sentence: "Subgroup 2 samples shall not be shipped".

* Table XV, delete and substitute:

TABLE XV. Group C inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of sample units for inspection	Number of failures
Monthly 1/				
Thermal shock	3.7	4.6.3		
Dielectric withstanding voltage	3.17	4.6.12		
Insulation resistance	3.18	4.6.13		
Low temperature operation	3.14	4.6.9	10	1
Short time overload	3.15	4.6.10		
Terminal strength	3.16	4.6.11		
Hermetic seal (when applicable)	3.10	4.6.21		
Quarterly				
Subgroup 1				
Resistance to soldering heat 2/	3.19	4.6.14		
Moisture resistance	3.20	4.6.15	10	1
Hermetic seal (when applicable)	3.10	4.6.21		
Subgroup 2				
Life	3.23	4.6.18	10	0
Semiannually				
Subgroup 1 1/				
Shock (specified pulse)	3.21	4.6.16	10	
Vibration (high frequency)	3.22	4.6.17		
Subgroup 2 3/				1
High temperature exposure	3.24	4.6.19	10	
Low temperature storage	3.25	4.6.20		

1/ If the manufacturer can demonstrate that these tests have been performed for five consecutive times with zero failures, these tests, with the approval of the quality activity, can be deleted. The manufacturer, however, shall perform these tests every three (3) years after the deletion as part of long term design verification. If the design, material, construction or processing of the part is changed, or if there are any problems, the qualifying activity may require resumption of the specified testing. Deletion of testing does not relieve the manufacturer from meeting the test requirement in case of dispute.

2/ The internal inspection shall be performed after the final inspection of the subgroup.

3/ If the manufacturer can demonstrate that this test has been performed for five consecutive times with zero failures, the frequency of this test, with the approval of the qualifying activity, can be performed on an annual basis. If the design, material, construction or processing of the part is changed, or if there are any quality problems or failures, the qualifying activity may require resumption of the original test frequency.

* 4.5.2.1.2, delete and substitute:

"4.5.2.1.2 Quarterly. Ten sample units with resistance values representative of production over that period shall be subjected to the tests of subgroup 1. Ten sample units of the value produced closest to the critical value shall be subjected to the test of subgroup 2. One defective unit shall be allowed for subgroup 1 and zero defects for subgroup 2."

* 4.5.2.1.3, delete and substitute:

"4.5.2.1.3 Semiannually. Ten sample units with the resistance values representative of production over that period shall be subjected to the tests of subgroup 1. Ten sample units with resistance values representative of production over that period shall be subjected to the tests of subgroup 2. One defective unit shall be allowed."

PAGE 29

4.6.5a, delete and substitute:

"a. Measuring apparatus: Different types of measuring test equipment (multimeters, bridges, or equivalent) are permitted to be used on the initial and final readings of this test, provided the equipment is the same style, model, or if it can be shown that the performance of the equipment is equivalent or better."

PAGE 31

TABLE XVII, delete and substitute (alters a change from amendment 2):

"TABLE XVII. Resistance-temperature characteristic.

Sequence	Temperature	
	Qualification inspection	Group B acceptance inspection 1/
	°C	°C
1	Room temperature 2/	Room temperature 2/
2	-15 ±3	-55 ±3
3	-55 ±3	Room temperature 2/
4	Room temperature 2/	+125 ±3
5	+65 ±3	---
6	+125 ±3	---

1/ At the option of the manufacturer, the reverse sequence may be as follows:

1	Room temperature 2/
2	+125 ±3
3	Room temperature 2/
4	-55 ±3

2/ This temperature shall be considered the reference temperature for each of the succeeding temperatures."

PAGE 33

4.6.14c, delete and substitute:

"c. Test condition C (solder 260°C ±5°C, 10 ±2 seconds). A board with a maximum area of nine square inches shall be used, and the leads shall not be cut."

PAGE 34

4.6.15b: Delete ".010" and substitute "0.10".

PAGE 37

4.6.19d, delete "d" and substitute "e" (alters change made in amendment 2).

* Add the following new 4.6.19d:

"d. Measurements during test: After removal from the test chamber, networks shall be permitted to stabilize at an ambient temperature of 25°C ±5°C for 6 hours. Resistance measurements shall be made as specified in 4.6.5. Networks shall be inspected for evidence of mechanical damage."

PAGE 38

Following 6.2, add:

"6.2.1 Retinning (hot solder dip) leads. If retinning (hot solder dip) of the leads is required, see 3.4.6."

Following 6.4.3, add:

"6.4.3.1 Tin plating finishes. Use of tin plating is prohibited (see 3.4.6). 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 refer to ASTM B545-83 (Standard Specification for Electrodeposited Coating of Tin)."

PAGE 42

TABLE XXII, delete and substitute:

" TABLE XXII. Extent of qualification by style.

Style	Will qualify style(s)
RZ010	RZ010
RZ020	RZ010, RZ020, RZ110 1/
RZ030	RZ030, RZ120 1/
RZ040	RZ040
RZ050	RZ040, RZ050
RZ060	RZ040, RZ050, RZ060
RZ070	RZ070
RZ080	RZ070, RZ080
RZ090	RZ070, RZ080, RZ090
RZ100	RZ030, RZ100, RZ120 1/
RZ110	RZ010, RZ020, RZ110 1/
RZ120	RZ030, RZ100, RZ120 1/
RZ130	RZ010, RZ130
RZ140	RZ010, RZ020, RZ110, RZ130, RZ140 1/
RZ150	RZ030, RZ120, RZ150 1/
RZ160	RZ040, RZ160
RZ170	RZ040, RZ050, RZ160, RZ170
RZ180	RZ180
RZ190	RZ190
RZ200	RZ040, RZ050, RZ060, RZ160, RZ170, RZ200
RZ210	RZ070, RZ210
RZ220	RZ070, RZ080, RZ210, RZ220
RZ230	RZ070, RZ080, RZ090, RZ210, RZ220, RZ230

1/ When styles RZ110 and RZ120 are included, additional test samples must be tested as specified in MIL-R-83401/11 and MIL-R-83401/12."

The margins of this amendment are marked with an asterisk to indicate where changes (additions, modifications, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 85
NASA - NA

Review activities:
Army - AR, AT, AV, ME, MI
Navy - AS, CG, MC, OS
Air Force - 17, 19
DLA - ES

Preparing activity:
Air Force - 85

Agent:
DLA - ES

(Project 59GP-0118)