NOTICE OF CHANGE

INCH-POUND

MIL-STD-199E
NOTICE 1
2 June 1993

MILITARY STANDARD

RESISTORS, SELECTION AND USE OF

TO ALL HOLDERS OF MIL-STD-199E:

1. THE FOLLOWING PAGES OF MIL-STD-199E HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
v	23 April 1991	REPRINTED WITHOUT CHANGE	
vi	2 June 1993	vi	23 April 1991
vii	2 June 1993	vii	23 April l991
3	2 June 1993	3	23 April l991
4	23 April 1991	REPRINTED WITHOUT CHANGE	
7	23 April 1991	REPRINTED WITHOUT CHANGE	
8	2 June 1993	8	23 April 1991
9a	2 June 1993	NEW	
11	23 April 1991	REPRINTED WITHOUT CHANGE	
12	2 June 1993	12	23 April l001
25	2 June 1993	25	23 April l991
26	23 April 1991	REPRINTED WITHOUT CHANGE	
27	23 April 1991	REPRINTED WITHOUT CHANGE	
28	2 June 1993	28	23 April l991
33	2 June 1993	33	23 April l991
34	23 April 1991	REPRINTED WITHOUT CHANGE	
200.1	2 June 1993	200.1	23 April l991
302.3	2 June 1993	302.3	23 April l991
302.4	23 April 1991	REPRINTED WITHOUT CHANGE	
302.7	23 April 1991	REPRINTED WITHOUT CHANGE	
302.8	2 June 1993	302.8	23 April 1991
305.5	23 April 1991	REPRINTED WITHOUT CHANGE	
305.6	2 June 1993	305.6	23 April l991
500.1	2 June 1993	500.1	23 April l991
501.5	23 April 1991	REPRINTED WITHOUT CHANGE	
501.6	2 June 1993	501.6	23 April l991
501.21	2 June 1993	501.21	23 April l991
501.22	2 June 1993	501.22	23 April 1991

2. THE FOLLOWING SECTION HAS BEEN REVISED AND SUPERSEDES THE SECTION LISTED:

NEW SECTION	DATE	SUPERSEDED SECTION	DATE
307	2 June 1993	307	23 April l991

3. THE FOLLOWING SECTION IS TO BE ADDED:

NEW SECTION	DATE
504	2 June 1993

4. RETAIN THIS NOTICE AND INSERT BEFORE THE TABLE OF CONTENTS.

5. Holders of MIL-STD-l99E will verify that page and section changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, and section, is a seperate publication. Each notice is to be retained by stocking points until the military standard is completely revised or canceled.

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 85

Review activities:

Army - AR, MI
Navy - AS, OS, SH
Air Force - 17, 80

User activities:

Army - AT, AV, ME
Navy - CG, MC
Air Force - 19

Preparing activity:

Army - ER

Agent:

DLA - ES

(Project 5905-1330)

SECTIONS

REPRINTED WITHOUT CHANGE

SECTION PAGE

CROSS REFERENCE
(Specification number to section number)

MIL-R-55182	-	Resistor, Fixed, Film, Established Reliability, General Specification For.
MIL-R-55342	-	Resistor, Fixed, Film, Chip, Established Reliability, General Specification For.
MIL-R-83401	-	Resistor Networks, Fixed, Film, General" Specification For.
MIL-T-23648	-	Thermistor (Thermally Sensitive Resistor) Insulated, General Specification For.
MIL-R-83530	-	Resistor, Voltage, Sensitive (Varistor, Metal-Oxide), General Specification For.
MIL-R-914	-	Resistor Networks, Fixed, Film, Surface Mount.

(Unless otherwise idnicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated general 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. DEFINITIONS

3.1 Rating and design application terms. A list of common terms used in rating and design application of resistors is as follows:

a. Ambient operating temperature. The temperature of the air surrounding an object, neglecting small localized variations.

b. Contact resistance variation. The apparent resistance seen between the wiper and the resistance element when the wiper is energized with a specified current and moved over the adjustment travel in either direction at a constant speed. The output variations are measured over a specified frequency bandwidth, exclusive of the effects due to roll-on or roll-off of the terminations and is expressed in ohms or percent of total nominal resistance.

c. Critical value of resistance. For a given voltage rating and a given power rating, there is only one value of resistance that will dissipate full rated power at rated voltage. This value of resistance is commonly referred to as the "critical value of resistance." For values of resistance below the critical value, the maximum (element) voltage is never reached and, for values of resistance above critical value, the power dissipated becomes lower than rated. Figure 1 shows this relationship.

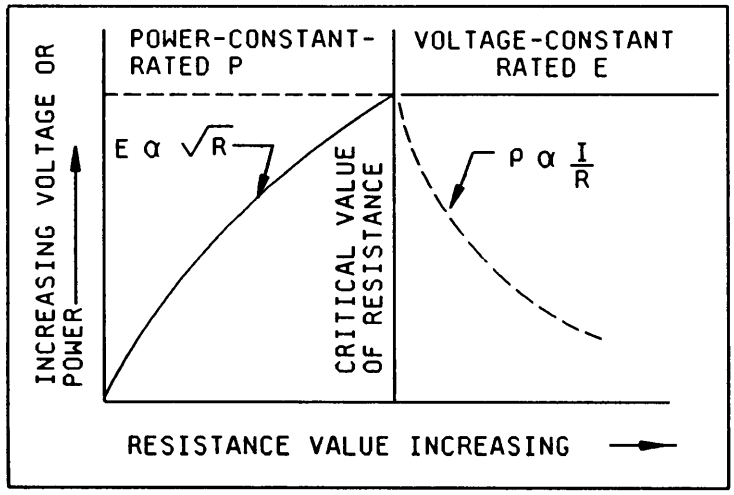

FIGURE 1. Maximum working voltage and critical value of resistance.

d. Dielectric strength. The ultimate breakdown voltage of the dielectric or insulation of the resistor when the voltage is applied between the case and all terminals tied together. Dielectric strength is usually specified at sea level and simulated high altitude air pressures.

5. DETAILED REQUIREMENTS

5.1 Detailed requirements. The detailed requirements for standard resistor types are contained in the applicable specification and the applicable section of this standard.

6. NOTES

6.1 Intended uses. General application notes are as indicated in the appendix.

6.2 Subject term (key word) listing.

Chip
Film
Fixed
Lead-screw
Network
Nonwirewound
Resistance-temperature characteristic
Resistor
Surface Mount
Thermistor
Variable
Varistor
Wirewound

6.3 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.

APPENDIX

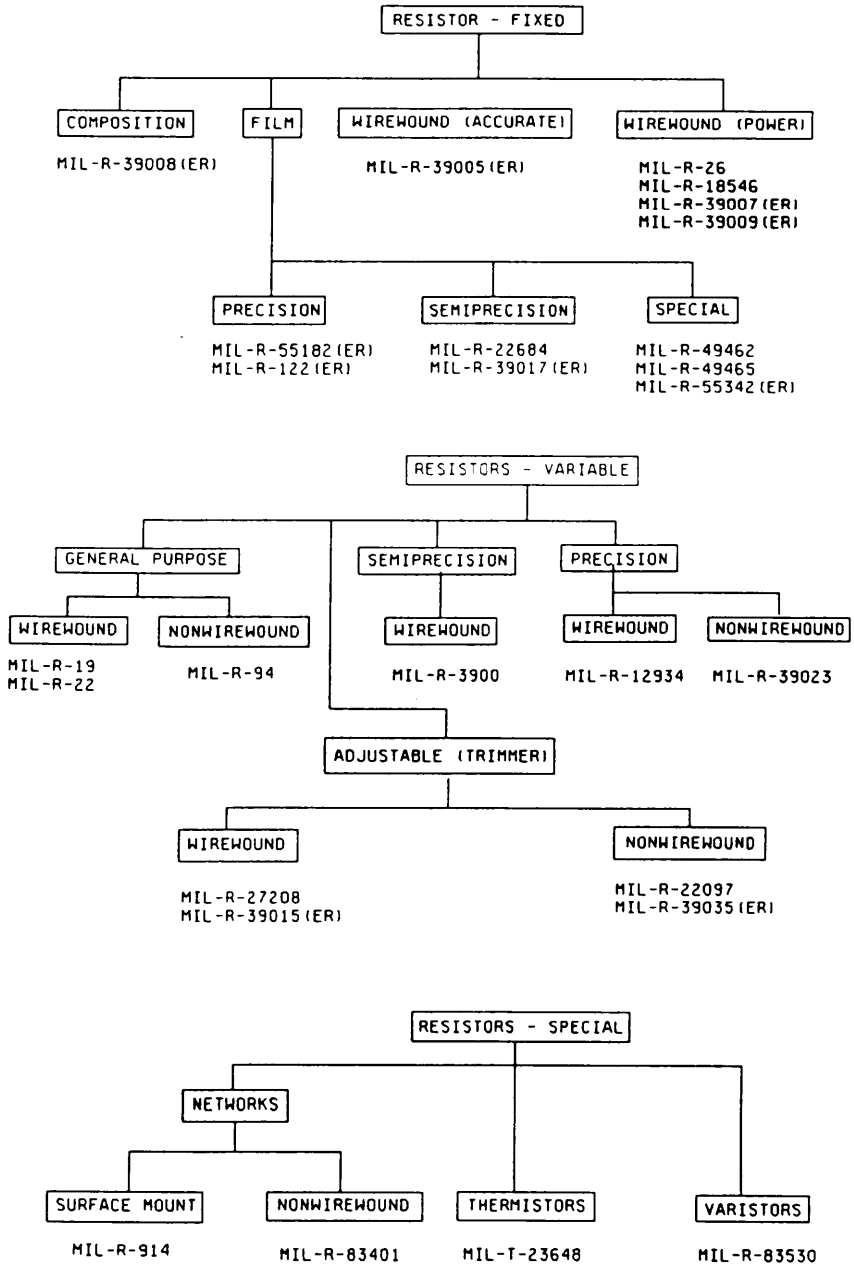

FIGURE 2. Military resistor specification categories.

p. MIL-R-39009, RER, fixed, wirewound (power type, chassis mounted). Use where power tolerance and relatively large power dissipation is required for a given unit size than is provided by MIL-R-39007 resistors, and where ac performance is noncritical (i.e., voltage divider or bleeder resistors in dc power supplies or series-dropping circuits).

q. MIL-R-39015, RTR, variable, wirewound (lead screw actuated). See MIL-R-27208.

r. MIL-R-39017, RLR, fixed, film (insulated). These film resistors have semiprecision characteristics and small sizes. The sizes and wattage ratings are comparable to those of MIL-R-39008 and stability is between MIL-R-39008 and MIL-R-55182. Design parameter tolerances are looser than those of MIL-R-55182 but good stability makes them desirable in most electronic circuits. Replaces MIL-R-22684, RL (fixed film (insulated)).

s. MIL-R-39023, RQ, variable, nonwirewound (precision). Use in servo mounting applications requiring precise electrical and mechanical output and performance. Used in computer, antenna, flight control, and bomb navigation systems, etc.

t. MIL-R-39035, RJR, variable, nonwirewound (adjustment type). Use for matching, balancing, and adjusting circuit variables in computers, telemetering equipment, and other critical applications.

u. MIL-R-49462, RHV, fixed, film, high voltage. These resistors are intended for use in electronic circuits where high voltages and high resistance values are used.

v. MIL-R-49465, RLV, fixed, metal element (power type). These resistors are for use where power type, very low resistance values are required. Values are for .1 ohm and below. These resistors are primarily for use in electrical, electronic, and communications type equipment.

w. MIL-R-55182, RNR, fixed, film (high stability). Use in circuits requiring higher stability than provided by composition resistors or film, insulated, resistors, and where ac frequency requirements are critical. Operation is satisfactory from dc to 100 megahertz (MHz). Metal films are characterized by low temperature coefficients and are usable for ambient temperatures of +125°C or higher with small degradation. Replaces MIL-R-10509, RN (fixed, film (high stability)).

x. MIL-R-55342, RM, chip, fixed, film. These chip resistors are primarily intended for incorporation into hybrid microelectronic circuits. They are designed for use in critical circuitry where stability, long life, reliable operation, and accuracy are of prime importance.

y. MIL-R-83401, RZ, network, fixed, film. These networks are designed for use in critical circuitry where stability, Long life, reliable operation, and accuracy are of prime importance. They are particularly desirable for use where miniaturization is important and ease of assembly is desired. They are useful where a number of resistors of the same resistance value are required in the circuit.

z. MIL-T-23648, thermistor (thermally sensitive resistor) insulated. These resistors exhibit a rapid change in resistance for a relative small temperature change. These resistors are used to measure temperature or to compensate for changes in temperature.

APPENDIX

aa. MIL-R-83530, RVS, voltage sensitive resistor, (varistor). These devices function as a nonlinear variable impedance dependent on voltage. They are designed to protect a circuit from a surge in voltage.

bb. MIL-R-914, RNS, fixed, film, surface mount. These devices are hermetically and nonhermetically sealed networks. They consist entirely of fixed, film resistors and are primarily intended for use in surface mount applications where space is a major concern.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. GENERAL CHARACTERISTICS OF RESISTORS

30.1 General characteristics of fixed resistors.

30.1.1 Fixed, composition resistors, RCR.

a. Nominal minimum resistance tolerance available for fixed, composition resistors is +5 percent. Combined effects of climate and operation on unsealedtypes may raise this tolerance to +15 percent from the low value (i.e., aging, pressure, temperature, humidity, voltage gradient, etc.).

b. High-voltage gradients will produce resistance change during operation.

c. High “Johnson” noise levels at resistances above 1 megohm preclude use in critical circuits of higher sensitivity.

d. RF will produce end-to-end shunted capacitive effects because of short resistor bodies and small internal distances between both ends.

e. Operation at VHF or higher frequency reduces effective resistance due to losses in the dielectric (the so-called “Boella” effect).

f. Exposure to humidity may have two effects on the resistance value: Surface moisture may result in leakage paths which will lower the resistance values or absorption of moisture into the element may increase the resistance. This phenomenon is more noticeable in higher ranges since it depends upon the resistance value.

g. The resistance temperature characteristic is the highest for general purpose resistor styles covered by military specifications.

30.1.2 Fixed, film resistors, RNR, RLR, and RL; fixed, film networks, RZ; fixed, film surface mount networks, RNS; and fixed, film chips, RM.

a. Low tolerance; high stability; low environmental changes; low temperature coefficient; spacing and weight saving; low noise.

b. Nominal minimum resistance tolerance available is +0.1 percent for fixed, film resistors; and for the resistor networks, the nominal minimum resistance tolerance available is +1.0 percent.

c. Maximum practical full-power operating temperature should not exceed +125°C for metal film RNR types; types RLR and RL resistors conform to the +70°C rating. Types RZ and RNS resistor networks and type RM resistor chips are continuously derated from +70°C to +125°C.

TABLE II. Special fixed resistor selection guidance table - Continued.

Section	Type	Styles available in standard	PIN	Voltage rating (V)	Energy rating (joules)	Clamping voltage at 100A (V)	Tolerance (ù)	Capacitance at 1 MHz (pF)	Clamping voltage at peak current rating (6000A) (V)	Max body size (inches)	Configuration (see figure 4)
503 MIL-T-83530	Varistor	RVS10	M83530/1 -20008	rms dc 130 175	70	325	±10	3800	570	1.10 x.95 x.32	W
		RVS10	M83530/1 -22000	150 200	80	360	±10, -5	3200	650	1.10 x.95 x.32	W
		RVS10	M83530/1 -4300E	275 369	140	680	+5, -10	1800	1200	1.10 x.95 x.32	W
		RVS10	M83530/1 -5100E	320 420	160	810	+5, -10	1500	1450	1.10 X.95 X.32	W

Section	Type	Styles available in standard	PIN	Schematics	Power rating Characteristics K & M	Power rating Characteristics C,R,H & V	Resistance tolerance (± percent)	Ohmic range	Temperature range (°C)	Resistance temperature coefficient (ppm/°C)	Max body size (inches)	Configuration (see fig. 4)
504 MIL-R-914	Fixed film surface mount	RNS010	M914J01-H1002FAS	A B J	.16 1.0 .08 1.0 .08 1.0	.060 .42 .032 .42	.1, .5, 1, 2, 5	10 to 2.2 M Ω	-55 to +125	±25, ±50, ±50, ±50, ±100, ±300	.300 x.390 x.104	P
		RNS020	M914J02-H1002FAS	A B C J	.16 1.2 .08 1.2 .08 1.2 .08 1.2	.060 .48 .032 .48 .060 .48	.1, .5, 1, 2, 5	10 to 2.2 M Ω	-55 to +125	±25, ±50, ±50, ±50, ±100, ±300	.300 x.440 x.104	R
		RNS030	M914G03-H1002FSS	W M S	.10 .80 .05 .75 .05 .70	.050 .40 .025 .40 .025 .35	.1, .5, 1, 2, 5	10 to 2.2 M Ω	-55 to +125	±25, ±50, ±50, ±50, ±100, ±300	.300 x.300 x.035, .300 x.300 x.085	I
		RNS040	M914G04-H1002FSS	P M E S	.10 1.0 .05 .95 .10 1.0 .05 1.0	.050 .50 .025 .50 .050 .50 .025 .50	.1, .5, 1, 2, 5	10 to 2.2 M Ω	-55 to +125	±25, ±50, ±50, ±50, ±100, ±300	.350 x.350 x.035, .350 x.350 x.085	I
		RNS050	M914G05-H1002AS	A B C J	.10 .80 .055 .80 .10 .80 .030 .80	.050 .40 .025 .40 .050 .40 .015 .40	.1, .5, 1, 2, 5	10 to 2.2 M Ω	-55 to +125	±25, ±50, ±50, ±50, ±100, ±300	.150 x.410 x.035	O

1/ Power rating at +70°C (full load ambient operating temperature).
2/ Full load ambient temperature and zero load temperature, respectively.

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of MIL-STD-199E
2 June 1993

TABLE III. Variable resistor selection guidance table.

Section	Type	Styles available in standard	Power rating (watts)	Taper data	Nominal total resistance	Temperature range (°C) 1/	Resistance temperature coefficient (ppm/°C)	Max body size (inches)	Configuration (see fig. 4)
201 (MIL-R-94)	Composition (insulated)	RV4	2, 1	A, C	50 to 5 MΩ	70 - 120		1.156 x .750	G
		RV6	.5, .25	A, C	100 to 5 MΩ	70 - 120		.516 x .593	G
		RV8	.5, .25	A, C	100 to 5 MΩ	70 - 120		1.188 x .520	G
202 (MIL-R-19)	Wirewound (low operating temperature)	RA20	2, 1.1	A (lin), C (10% CW)	3 to 15 kΩ	40 - 105		1.310 x .700	G
		RA30	4, 2.2		3 to 25 kΩ	40 - 105		1.710 x .810	G
203 (MIL-R-22)	Wirewound (power type)	RP05	5	Linear	10 to 5 kΩ	25 - 340		.525 x .687	G
		RP06	12.5	"	1 to 3.5 kΩ	"		.906 x .751	G
		RP10	25	"	2 to 5 kΩ	"		1.680 x 1.410	G
		RP15	50	"	1 to 10 kΩ	"		2.410 x 1.440	G
		RP20	75	"	2 to 10 kΩ	"		2.810 x 1.780	G
		RP25	100	"	2 to 10 kΩ	"		3.190 x 1.780	G
		RP30	150	"	2 to 10 kΩ	"		4.060 x 2.030	G
204 (MIL-R-12934)	Wirewound, precision	RR0900	1.25	Linear	100 to 10 kΩ	85 - 150	±30, ±100	.880 x .812	H
		RR1000	2.0	"	100 to 50 kΩ	"	"	.880 x 1.625	H
		RR1100	1.5	"	100 to 20 kΩ	"	"	1.067 x .812	H
		RR1300	2.0	"	100 to 40 kΩ	"	"	1.442 x 2.250	H
		RR1400	3.0	"	200 to .2 MΩ	"	"	2.005 x 1.312	H
		RR2000	4.0	"	100 to 60 kΩ	"	"	2.005 x 2.250	H
		RR2100	5.0	"	200 to .25 MΩ	"	"	3.005 x 1.312	H
		RR3000	6.0	"	200 to .1 MΩ	"	"	.906 x .750	H
		RR3100	1.25	"	100 to 10 kΩ	"	"	1.093 x .750	H
		RR3200	1.50	"	100 to 20 kΩ	"	"	1.468 x 1.062	H
		RR3300	2.0	"	100 to 40 kΩ	"	"	2.031 x 1.156	H
		RR3400	4.0	"	100 to 60 kΩ	"	"	3.031 x 1.156	H
		RR3500	6.0	"	200 to 100 kΩ	"	"	.906 x 1.076	H
		RR3700	1.5	"	100 to 50 kΩ	"	"	.906 x 1.219	H
		RR3900	1.5	"	100 to 100 kΩ	"	"	.890 x 1.500	H
		RR4000	2.0	"	100 to 50 kΩ	"	"	1.844 x 2.094	H
		RR4100	5.0	"	200 to 250 kΩ	"	"		H
205 (MIL-R-39002)	Wirewound, semi-precision	RK09	1.5	Linear	10 to 50 kΩ	85 - 135	±70 (R≥50Ω), ±200 (R<50Ω)	.515 x .650	J
206 (MIL-R-27208)	Wirewound (adjustment type)	RT26	.25		10 to 2 kΩ	85 - 150	±50	.185 x .270 x .270	K
207 (MIL-R-22097)	Nonwirewound (adjustment type)	RJ24	.5		10 to 1 kΩ	85 - 150	±100, ±250	.375 x .375 x .150	K
208 (MIL-R-23285)	Nonwirewound	RVC6	.5	A, C	100 to 1 MΩ	125 - 175	±250	.516 x .469	J
209 (MIL-R-39023)	Nonwirewound, precision	RQ090	1.0	Linear	100 to 1 MΩ	70 - 125		.880 x .810	H
		RQ100	2.5	"	1000 TO 1 MΩ	"		.880 x 1.88	H
		RQ110	1.25	"	100 to 1 MΩ	"		1.067 x .810	H
		RQ150	1.50	"	100 to 1 MΩ	"		1.442 x 1.06	H
		RQ160	3.5	"	1000 to 3 MΩ	"		1.442 x 2.50	H
		RQ200	2.00	"	100 to 1 MΩ	"		2.005 x 1.31	H
		RQ210	4.5	"	1000 to 3 MΩ	"		2.005 x 2.90	H
		RQ300	3.00	"	100 to 1 MΩ	"		3.005 x 1.31	H

See footnotes at end of table.

TABLE III. Variable resistor selection guidance table - Continued.

Section	Type	Styles available in standard	Power rating (watts)	Taper data	Nominal total resistance	Temperature range (°C) 1/	Resistance temperature coefficient (ppm/°C)	Max body size (inches)	Configuration (see fig. 4)
401 (MIL-R-39015)	Wirewound (lead-screw actuated), established reliability	RTR12	.75		10 to 10 k Ω	85 - 150	+50	1.260 x .200 x .330	L
		RTR22	.75		10 to 10 k Ω	"	"	.510 x .197 x .510	K
		RTR24	.75		10 to 5 k Ω	"	"	.390 x .245 x .390	K
402 (MIL-R-39035)	Nonwirewound (adjustment type), established reliability	RJR12	.75		10 to 1 M Ω	85 - 150	+50, +100, +250	1.260 x .330 x .200	L
		RJR24	.5		10 to 1 M Ω	"	"	.390 x .195 x .420	K
		RJR26	.25		50 to 1 M Ω	"	"	.270 x .195 x .270	K
		RJR28	.3		100 to 2 M Ω	"	"	.510 x .110 x .180	L
		RJR50	.25		10 to 1 M Ω	"	"	.270 x .270 x .250	M

1/ Full load ambient operating temperature and zero load temperature, respectively.

TABLE IV. Military specification to NATO style cross reference.

Military specification	Military type	Equivalent NATO style	NEPR number	Military specification	Military type	Equivalent NATO style	NEPR number
Fixed resistors							
MIL-R-26 (see section 101)	RW29	NRW01	5	MIL-R-55182 (see section 302 - continued)	RNR65H	NRN02	6
	RW31	NRW02	"		RNR65J	NRN34	"
	RW33	NRW03	"		RNR65K	NRN54	"
	RW35	NRW04	"		RNR70E	NRN45	"
	RW37	NRW05	"		RNR70H	NRN03	"
	RW38	NRW06	"		RNR70J	NRN35	"
	RW47	NRW07	"		RNR70K	NRN55	"
	RW56	NRW09	"				
MIL-R-39008 (see section 301)	RCR05	NRC06	2	MIL-R-39005 (see section 303)	RBR52	NRB10	8
	RCR07	NRC02	"		RBR53	NRB09	"
	RCR20	NRC03	"		RBR54	NRB08	"
	RCR32	NRC04	"		RBR55	NRB07	"
	RCR42	NRC05	"		RBR56	NRB19	"
					RBR57	NRB18	"
					RBR71	NRB14	"
MIL-R-55182 (see section 302)	RNR50H	NRN22	6	MIL-R-39007 (see section 304)	RWR78	NRW53	72
	RNR50J	NRN31	"		RWR80	NRW54	"
	RNR50K	NRN51	"		RWR81	NRW55	"
	RNR55E	NRN42	"		RWR84	NRW56	"
	RNR55H	NRN21	"		RWR89	NRW57	"
	RNR55J	NRN32	"				
	RNR55K	NRN52	"	MIL-R-39017 (see section 305)	RLR05C	NRC16	"
	RNR60E	NRN43	"		RLR07C	NRC11	"
	RNR60H	NRN01	"		RLR20C	NRC12	"
	RNR60J	NRN33	"		RLR32C	NRC13	"
	RNR60K	NRN55	"		RLR42C	NRC15	"
	RNR65E	NRN44	"				
Variable resistors							
MIL-R-94 (see section 201)	RV4S	NRV06	10	MIL-R-22 (see section 203)	RP05	NRP08	11
	RV4T	NRV20	"		RP06	NRP07	"
	RV6S	NRV10	"		RP10	NRP02	"
	RV6T	NRV21	"		RP15	NRP03	"
MIL-R-19 (see section 202)	RA20	NRA08	9		RP20	NRP04	"
	RA30	NRA10	"		RP25	NRP05	"
					RP30	NRP06	"

APPENDIX

TABLE V. Detail specification number by style number.

Style	Detail Specification	Military Specification	Section		Style	Detail Specification	Military Specification	Section
RA10	1	MIL-R-19	202		RLR20	2	MIL-R-39017	305
RA20	2	"	"		RLR32	3	"	"
RA30	3	"	"		RL42..TX	8	MIL-R-22684	102
RBR52	1	MIL-R-39005	303		RLV10	1	MIL-R-49465	104
RBR53	2	"	"		RLV20	2	"	"
RBR54	3	"	"		RLV21	3	"	"
RBR55	4	"	"		RLV22	4	"	"
RBR56	5	"	"		RLV23	5	"	"
RBR57	7	"	"		RLV30	6	"	"
RBR71	6	"	"		RLV31	7	"	"
RBR74	8	"	"		RLV32	8	"	"
RBR75	9	"	"		RLV40	9	"	"
RBR76	10	"	"		RLV41	10	"	"
RBR80	11	"	"		RLV42	11	"	"
RBR81	11	"	"		RLV43	12	"	"
RCR05	4	MIL-R-39008	301		RM0502	1	MIL-R-55342	307
RCR07	1	"	"		RM0505	2	"	"
RCR20	2	"	"		RM1005	3	"	"
RCR32	3	"	"		RM1505	4	"	"
RCR42	5	"	"		RM2208	5	"	"
RER40	2	MIL-R-39009	306		RM0705	6	"	"
RER45	2	"	"		RNC50	7	MIL-R-55182	302
RER50	2	"	"		RNC55	1	"	"
RER55	2	"	"		RNC60	3	"	"
RER60	1	"	"		RNC65	5	"	"
RER65	1	"	"		RNC70	6	"	"
RER70	1	"	"		RNC75	10	"	"
RER75	1	"	"		RNC90	9	"	"
RE77	2	MIL-R-18546	103		RNR50	7	"	"
RE80	2	"	"		RNR55	1	"	"
RFP01	1	MIL-R-122	308		RNR60	3	"	"
RFP03	3	"	"		RNR65	5	"	"
RFP06	6	"	"		RNR70	6	"	"
RFP10	10	"	"		RNR75	10	"	"
RHV30	3	MIL-R-49462	105		RNS010	1	MIL-R-914	504
RHV31	3	"	"		RNS020	2	"	"
RHV32	3	"	"		RNS030	3	"	"
RHV33	3	"	"		RNS040	4	"	"
RHV34	3	"	"		RNS050	5	"	"
RHV35	3	"	"		RP05	15	MIL-R-22	203
RJR12	1	MIL-R-39035	402		RP06	1	"	"
RJR24	2	"	"		RP07	2	"	"
RJR26	3	"	"		RP10	3	"	"
RJR28	5	"	"		RP11	4	"	"
RJR50	4	"	"		RP15	5	"	"
RK09	1	MIL-R-39002	205		RP16	6	"	"
RK11	3	"	"		RP20	7	"	"
RLR05	5	MIL-R-39017	305		RP25	8	"	"
RLR07	1	"	"					

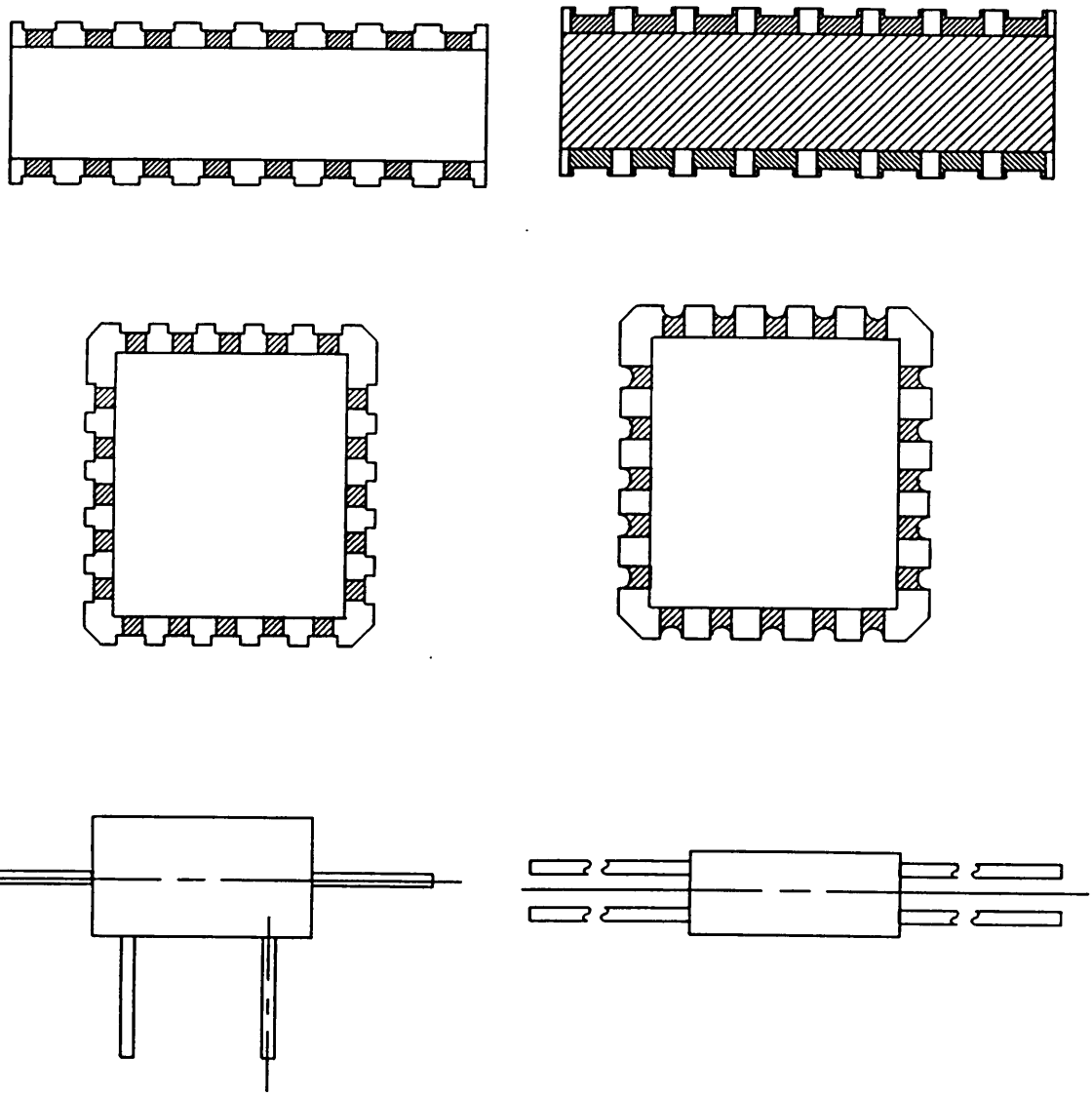

FIGURE 4. Configurations - Continued.

CONCLUDING MATERIAL

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

Review activities:
Army - AR, MI
Navy - AS, OS, SH
Air Force - 17, 80
DLA - ES

User activities:
Army - AT, AV, ME
Navy - CG, MC
Air Force - 19

Preparing activity:
Army - ER

Agent:
DLA - ES

(Project 5905-1220)

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SECTION 200

RESISTORS, VARIABLE

2.7 Pulse applications. When metal film resistors are used in low duty cycle pulse circuits, peak voltage should not exceed 1.4 times the rated continuous working voltage (RCWV). However, if the duty cycle is high or the pulse width is appreciable, even though average power is within ratings, the instantaneous temperature rise may be excessive, requiring a resistor of higher wattage rating. Peak power dissipation should not exceed four times the maximum rating of the resistor under any conditions.

2.8 Voltage coefficient. The voltage coefficient for resistors of 1,000 ohms and above shall not exceed ±.005 percent per volt.

2.9 Noise. Noise output is uncontrolled by the specification but, is considered a negligible quantity.

2.10 Mounting. Under conditions of severe shock or vibration (or a combination of both), resistors should be mounted in such a fashion that the body of the resistor is restrained from movement with respect to the mounting base. It should be noted that if clamps are used, certain electrical characteristics of the resistor will be altered. The heat-dissipating qualities of the resistor will be enhanced or retarded depending on whether the clamping material is a good or poor heat conductor.

2.11 Failure rate factors. Failures are considered to be opens, shorts, or radical departures from initial characteristics occurring in an unpredictable manner, and in too short a period of time to permit detection through normal preventive maintenance. Failure rate factors applicable to this specification are stated in MIL-HDBK-217. The failure rate factors stated in MIL-HDBK-217 are based on "catastrophic failures" and will differ from the failure rates established in the specification, since the established failure rate is based on a "parametric failure" of 2.0 percent change in resistance to be expected at O to 10,000 hours of life tests at rated conditions.

2.12 Screening. All resistors furnished under MIL-R-55182 are subjected to conditioning through thermal shock and overload testing.

2.13 Terminal substitution data. Hermetically sealed resistors (characteristics C and E, with terminal R) are a direct one-way substitute for hermetically sealed resistors (characteristics H, J, and K with termination C), provided all other characteristics are equal or better.

3. ITEM IDENTIFICATION (see figures 302-2 through 302-4).

3.1 Type designation. The type designation is used for identifying and describing the resistor as shown on figure 302-2 or figure 302-3.

3.2 Resistance values. Resistance values for the F (1.0 percent) and D (0.5 percent) tolerances shall follow the tabulation shown in table 302.I. Resistance values for tolerance B (0.1 percent), A (0.05 percent), T (0.01 percent), and V (0.005 percent) may be any value, but it is preferred that the values be chosen from the D tolerance values given in the tabulation (see table 302-I).

3.3 Performance characteristics. The performance characteristics of these resistors are as shown in table 302-II.

3.4 Terminal types. Preferred lead types associated with the applicable characteristic are as follows:

Characteristic	Terminal designator	Specification indicates weldable	Specification indicates solderable
C	N (Type N-22 of MIL-STD-1276), R	N - Yes R - No	N - No R - Yes
H	C (Type C31, C32, or C52 of MIL-STD-1276)	Yes	Yes
E	N (Type N-22 of MIL-STD-1276), R	N - Yes R - No	N - No R - Yes
J	C (Type C31, C32, or C52 of MIL-STD-1276)	Yes	Yes
K	C (Type C31, C32, or C52 of MIL-STD-1276)	Yes	Yes
Y 1/	C (Type C31, C32, or C52 of MIL-STD-1276)	Yes	Yes

1/ Applicable to style RNC90 only.

Symbol	Terminal
RNR 1/	Solderable
RNC 2/	Solderable/weldable (Type C31, C32, or C52 of MIL-STD-1276)
RNN	Weldable (Type N-22 of MIL-STD-1276)

1/ Terminal R is inactive for design when specified with characteristics H, J, and K.
2/ RNC terminal are substitutable for terminal type RNR (see 2.13).

TABLE 302.1 Resistance tolerance.

D (0.5)	F (1.0)	D (0.5)	F (1.0)	D (0,5)	F (1.0)	D (0.5)	F (1.0)
10.0	10.0	17.8	17.8	31.6	31.6	56.2	56.2
10.1	----	18.0	----	32.0	----	56.9	----
10.2	10.2	18.2	18.2	32.4	32.4	57.6	57.6
10.4	----	18.4	----	32.8	----	58.3	----
10.5	10.5	18.7	18.7	33.2	33.2	59.0	59.0
10.6	----	18.9	----	33.6	----	59.7	----
10.7	10.7	19.1	19.1	34.0	34.0	60.4	60.4
10.9	----	19.3	----	34.4	----	61.2	----
11.0	11.0	19.6	19.6	34.8	34.8	61.9	61.9
11.1	----	19.8	----	35.2	----	62.6	----
11.3	11.3	20.0	20.0	35.7	35.7	63.4	63.4
11.4	----	20.3	----	36.1	----	64.2	----
11.5	11.5	20.5	20.5	36.5	36.5	64.9	64.9
11.7	----	20.8	----	37.0	----	65.7	----
11.8	11.8	21.0	21.0	37.4	37.4	66.5	66.5
12.0	----	21.3	----	37.9	----	67.3	----

RNC90 Y 162R00 B M

Style and terminal type: The three-letter symbol identifies established reliability, film, fixed resistors of a specified terminal-type; the two-digit number identifies the size and configuration. (See 3.4.)

Characteristic: The single-letter symbol identifies the characteristic (as specified in table 302-II) as follows:

Y - - - ±5 ppm/°C; +125°C max ambient temperature at rated wattage

Resistance: Six characters identify the nominal resistance value, expressed in ohms -- five digits, all significant, and a single letter. The letter is used simultaneously as a decimal point and a multiplier. For values less than 1,000 ohms, the letter "R" represents the decimal point. For values 1,000 ohms or greater but less than 1 megohm, the letter "K" represents the decimal point. For values 1 megohm or greater, the letter "M" represents the decimal point. (See the following example.)

Example:

50R500- - - - - 50.5 ohms
50K500- - - - - 50,500 ohms
5M0500- - - - - 5,050,000 ohms

Resistance tolerance: The single-letter symbol identifies the resistance tolerance as follows:

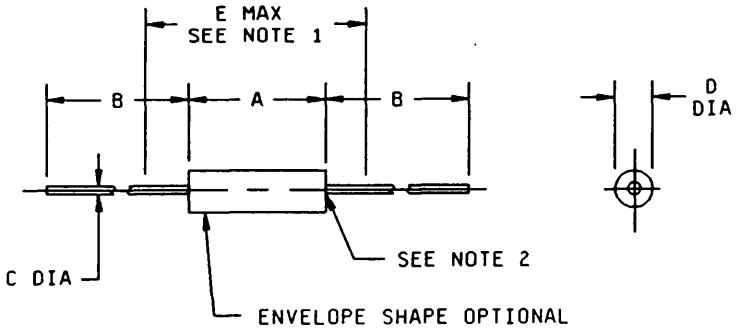
V - - - ±.005 percent resistance tolerance
T - - - ±.01 percent resistance tolerance
A - - - ±.05 percent resistance tolerance
B - - - ±0.1 percent resistance tolerance
D - - - ±0.5 percent resistance tolerance
F - - - ±1.0 percent resistance tolerance

Life failure rate designation: The single-letter symbol identifies the life failure rate as follows:

M - - - - - 1.0 percent/1,000 hours
P - - - - - 0.1 percent/1,000 hours
R - - - - - 0.01 percent/1,000 hours
S - - - - - 0.001 percent/1,000 hours

FIGURE 302-3. Type designation example for style RNC90.

STYLES RNR50, RNR55, RNR60, RNR65, RNR70, AND RNR75



	Standard style	Dimensions (inches)				
		A	B 1/	C ±.002	D	E max
*	RNR50 2/	.150 ±.020	1.250 ±.266	.016	.065 ±.015	.225
*	RNR55	.250 +.031 -.046	1.500 ±.125	.025	.109 ±.031	.379
	RNR60	.375 +.062 -.115	1.500 ±.125	.025	.125 ±.040	.561
	RNR65	.625 +.031 -.094	1.500 ±.125	.025	.188 +.062 -.031	.780
	RNR70	.750 +.125 -.062	1.500 ±.125	.032	.250 +.078 -.031	.939
	RNR75	1.062 ±.062	1.500 ±.125	.032	.375 +.062 -.031	1.186

1/ Lead length for tape and reel packaging shall be 1 inch minimum.

2/ For characteristics C, E, dimensions A = .180 ±.020.

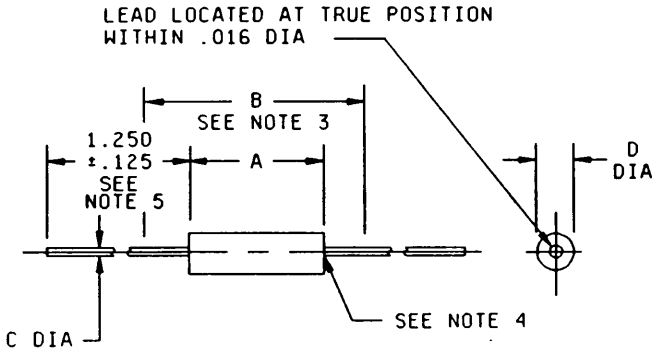
* Third letter is variable, dependent upon lead material or capability.

Inches	mm	Inches	mm
.002	0.05	.062	1.57
.003	0.08	.090	2.29
.004	0.10	.125	3.18
.005	0.13	.138	3.51
.008	0.20	.145	3.68
.015	0.38	.225	5.72
.018	0.46	.250	6.35
.023	0.58	.318	8.08
.025	0.64	.375	9.53
.031	0.79	.562	14.27
.040	1.02	.688	17.48
.041	1.04	1.000	25.40
.045	1.14	1.500	38.10

NOTES:
1. Maximum length is “clean lead” to “clean lead”.
2. The end of the body is that point at which the body diameter equals the nearest drill size larger than 250 percent of the nominal lead diameter.

FIGURE 302-4. Established reliability, film, fixed resistors.

STYLES RLR05, RLR07, RLR20, AND RLR32



Standard style	Dimension (inches)			
	A	B max	C ±.002	D
RLR05	.015 ±.020	.187	.016 ±.001	.066 ±.008
RLR07	.250 +.031 −.046	.300	.025	.090 ±.008
RLR20	.375 ±.041	.450	.032	.138 ±.023
RLR32	.562 +.031 −.042	.625	.040	.190 ±.015

Inches	mm	Inches	mm	Inches	mm	Inches	mm
.001	0.03	.025	0.64	.066	1.68	.318	8.08
.002	0.06	.031	0.79	.090	2.29	.375	9.53
.006	0.15	.032	0.81	.125	3.18	.380	9.65
.008	0.20	.040	1.02	.138	3.51	.450	11.43
.015	0.38	.041	1.04	.150	3.81	.562	14.27
.016	0.41	.042	1.07	.187	4.75	.625	15.88
.018	0.46	.045	1.14	.190	4.83	.688	17.48
.020	0.51	.046	1.17	.250	6.35	.756	19.20
.023	0.58	.064	1.63	.300	7.62	1.250	33.73

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Maximum length is “clean lead” to “clean lead”
4. The end of the body is that point at which the body diameter equals the nearest drill size larger than 250 percent of the nominal lead diameter (150 percent for RLR07).
5. Length is 1.250 (31.75 mm) ±.266 (6.76 mm) for style RLR05.
6. Lead length for tape and real packaging shall be 1 inch minimum.

FIGURE 305-4. Established reliability, fixed film resistors (insulated).

TABLE 305-I. Performance characteristics.

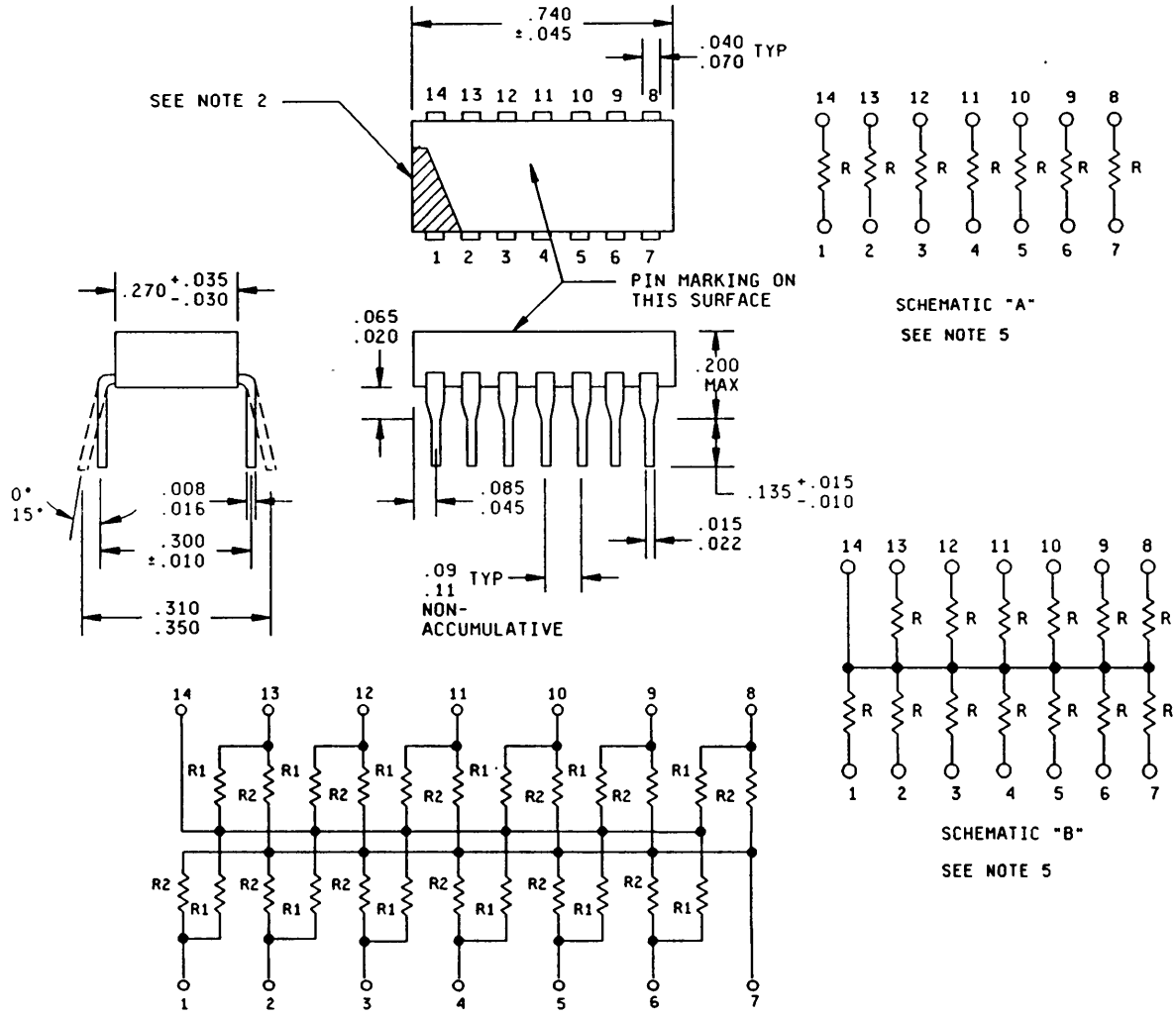
Style	RLR05		RLR07		RLR20		RLR32	
Maximum resistance-temperature characteristic in parts/million/°C (reference to 25 °C)	±100	±350	±100	±350	±100	±350	±100	±350
Maximum ambient temperature at rated wattage	70°C	70°C	70°C	70°C	70°C	70°C	70°C	70°C
Maximum ambient temperature at zero wattage derating	150°C	125°C	150°C	125°C	150°C	125°C	150°C	125°C
Power rating and maximum dc or rms voltage	.125 W 200 V	.125 W 200 V	.25 W 250 V	.25 W 250 V	.50 W 350 V	.50 W 350 V	1 W 500 V	1 W 500 V
Resistance tolerance (in percent)	1,2	2,5,10	1,2	2,5,10	1,2	2,5,10	1,2	2,5,10
Minimum resistance value (ohms)	4.7	1.1 M	10	11 M	4.3	3.3 M	10	3.0 M
Maximum resistance value (ohms)	1 M	22 M	10 M	22 M	3.01 M	22 M	2.7 M	22 M
Maximum ± percent change in resistance after 1/								
Power conditioning	.5	1	.5	1	.5	1	.5	1
Thermal shock	.25	1	.25	1	.25	1	.25	1
Low-temperature storage	.25	.5	.25	.5	.25	.5	.25	.5
Low-temperature operation	.25	.5	.25	.5	.25	.5	.25	.5
Short-time overload	.5	1	.5	1	.5	1	.5	1
Terminal strength	.25	.5	.25	.5	.25	.5	.25	.5
Dielectric withstanding voltage	.25	.25	.25	.25	.25	.25	.25	.25
Resistance to soldering heat	.25	.5	.25	.5	.25	.5	.25	.5
Moisture resistance	1	5	1	5	1	5	1	5
Shock	.5	.5	.5	.5	.5	.5	.5	.5
Vibration, high frequency	.5	.5	.5	.5	.5	.5	.5	.5
Life		4		4		4		4
High temperature exposure	2	5	2	5	2	5	2	5
Insulation resistance (dry)	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm
Insulation resistance (wet)	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm	1,000 megohm

1/ Where total resistance change is 1 percent or less, it shall be considered as ±(percent +0.05 ohm).

SECTION 500

RESISTORS, SPECIAL

STYLE RZ010



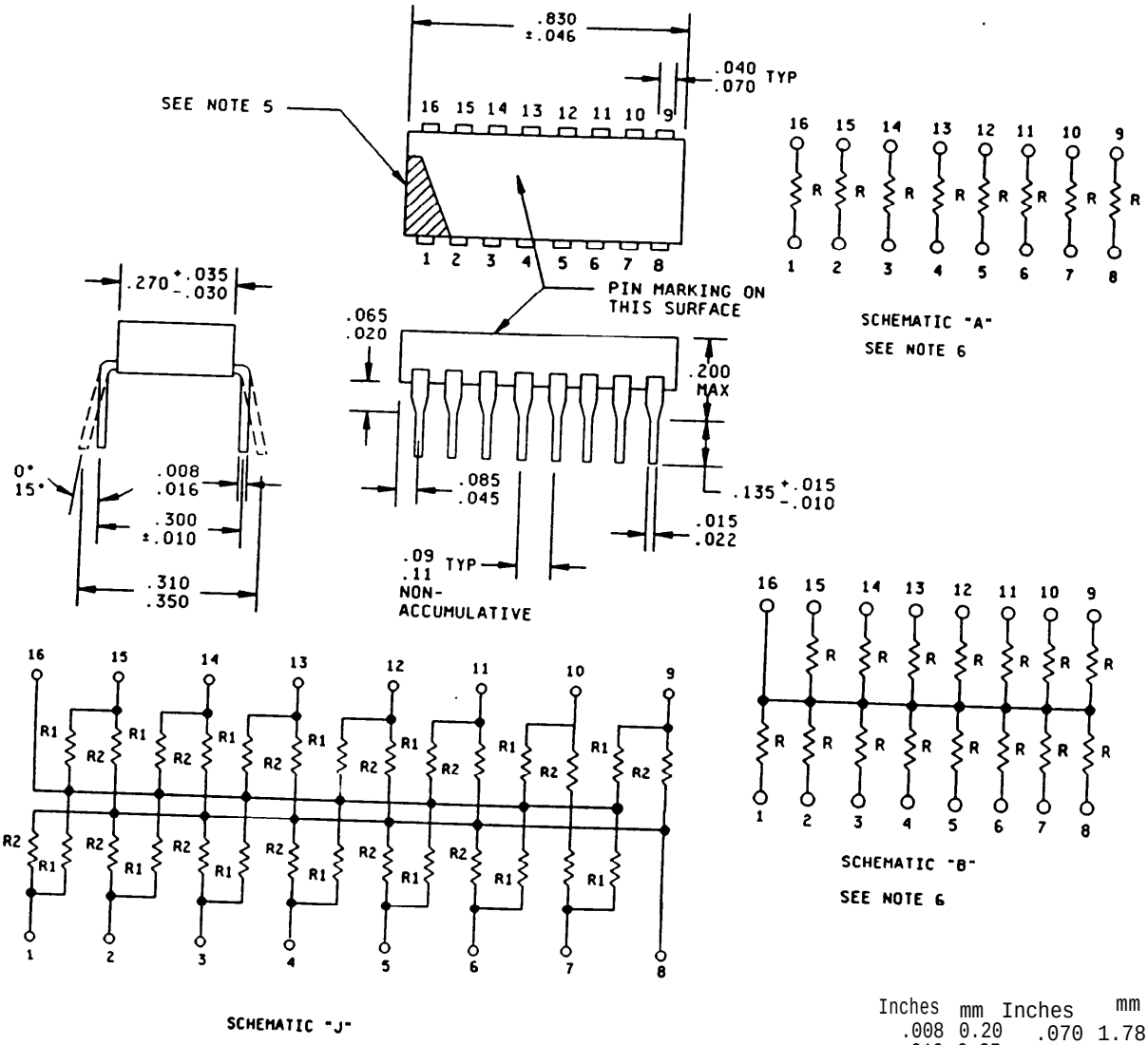
Inches	mm	Inches	mm	Inches	mm
.008	0.20	.040	1.02	.200	5.03
.010	0.25	.045	1.14	.270	6.86
.015	0.38	.065	1.65	.300	7.62
.016	0.41	.070	1.78	.310	7.87
.020	0.51	.085	2.16	.350	8.89
.022	0.56	.090	2.29	.740	18.80
.030	0.76	.110	2.79		
.035	0.89	.135	3.43		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. The picturization of this style is given as representative of the envelope of the item. Slight deviations from the outline shown are acceptable.
4. Pin 1 locator is a dot, stripe, notch, or numeral 1 adjacent to pin number 1 in the shaded area.
5. All resistors are equal in value.

FIGURE 501-3. Fixed film resistor networks.

STYLE RZ020

STYLE RZ020



Inches	mm	Inches	mm
.008	0.20	.070	1.78
.010	0.25	.085	2.16
.015	0.38	.090	2.29
.016	0.41	.110	2.79
.020	0.51	.135	3.43
.022	0.56	.200	5.08
.030	0.76	.270	6.86
.035	0.89	.300	7.62
.040	1.02	.310	7.87
.045	1.14	.350	8.89
.046	1.17	.830	21.08
.065	1.65		

FIGURE 501-3. Fixed film resistor networks - Continued.

TABLE 501-II. Performance characteristics.

Features		H		K		M		V		C	
Resistance temperature characteristic, ppm/°C		±50		±100		±300		±50		±50	
Maximum ambient temperature at rated wattage		+70°C		+70°C		+70°C		+70°C		+70°C	
Maximum ambient temperature at zero power rating		+125°C		+125°C		+125°C		+125°C		+125°C	
Maximum operating voltage for each resistor (volts):											
Style RZ010		100 V		100 V		100 V		100 V		100 V	
Style RZ020		100 V		100 V		100 V		100 V		100 V	
Style RZ030		50 V		50 V		50 V		N/A		N/A	
Style RZ040		N/A 1/		50 V		50 V		"		"	
Style RZ050		"		50 V		50 V		"		"	
Style RZ060		"		50 V		50 V		"		"	
Style RZ070		"		50 V		50 V		"		"	
Style RZ080		"		50 V		50 V		"		"	
Style RZ090		"		50 V		50 V		"		"	
Power rating (watts) at 70°C		Element	Network	Element	Network	Element	Network	Element	Network	Element	Network
Style RZ010	Schematic A	.2	1.4	.2	1.4	.2	1.4	.1	.7	.1	.7
	Schematic B	.1	1.3	.1	1.3	.1	1.3	N/A	N/A	N/A	N/A
	Schematic J	N/A	N/A	.05	1.2	.05	1.2	"	"	"	"
Style RZ020	Schematic A	.2	1.6	.2	1.6	.2	1.6	.1	.8	.1	.8
	Schematic B	.10	1.5	.10	1.5	.10	1.5	N/A	N/A	N/A	N/A
	Schematic J	N/A	N/A	.05	1.4	.05	1.4	"	"	"	"
Style RZ030	Schematic A	.05	.35	.05	.35	.05	.35	"	"	"	"
	Schematic B	.025	.325	.025	.325	.025	.325	"	"	"	"
	Schematic J	N/A	N/A	.015	.35	.015	.35	"	"	"	"
Style RZ040	Schematic C	"	"	.2	1.8	.2	1.8	"	"	"	"
	Schematic H	"	"	.11	1.8	.11	1.8	"	"	"	"
	Schematic G	"	"	.2	1.0	.2	1.0	"	"	"	"
Style RZ050	Schematic C	"	"	.2	1.8	.2	1.8	"	"	"	"
	Schematic H	"	"	.11	1.8	.11	1.8	"	"	"	"
	Schematic G	"	"	.2	1.0	.2	1.0	"	"	"	"
Style RZ060	Schematic C	"	"	.2	1.8	.2	1.8	"	"	"	"
	Schematic H	"	"	.11	1.8	.11	1.8	"	"	"	"
	Schematic G	"	"	.2	1.0	.2	1.0	"	"	"	"
Style RZ070	Schematic C	.12	.60	.12	.60	.12	.60	"	"	"	"
	Schematic H	N/A	N/A	.07	.60	.07	.60	"	"	"	"
	Schematic G	.12	.36	.12	.36	.12	.36	"	"	"	"
Style RZ080	Schematic C	.12	.84	.12	.84	.12	.84	"	"	"	"
	Schematic H	N/A	N/A	.07	.84	.07	.84	"	"	"	"
	Schematic G	.12	.48	.12	.48	.12	.48	"	"	"	"
Style RZ090	Schematic C	.12	1.08	.12	1.08	.12	1.08	"	"	"	"
	Schematic H	N/A	N/A	.07	1.08	.07	1.08	"	"	"	"
	Schematic G	.12	.60	.12	.60	.12	.60	"	"	"	"

See footnotes at end of table.

TABLE 501-II. Performance characteristics - Continued.

Features	H		K		M		V		C	
Power rating (watts) at 25°C	Element	Network	Element	Network	Element	Network	Element	Network	Element	Network
Style RZ010 Schematic A	.25	1.75	.25	1.75	.25	1.75	.125	.875	.825	.875
Schematic B	.125	1.625	.125	1.625	.125	1.625	N/A	.812	N/A	N/A
Schematic J	.0625	1.5	.06	1.44	.06	1.44	"	.75	"	"
Style RZ020 Schematic A	.25	2.0	.25	.20	.25	2.0	.125	1.00	.125	1.00
Schematic B	.125	1.875	.125	1.875	.125	1.875	N/A	.94	N/A	N/A
Schematic J	N/A	N/A	.06	1.68	.06	1.68	"	"	"	"
Style RZ030 Schematic A	.063	.438	.063	.438	.063	.438	"	"	"	"
Schematic B	.031	.406	.031	.406	.031	.406	"	"	"	"
Schematic J	N/A	N/A	.019	.45	.019	.45	"	"	"	"
Style RZ040 Schematic C	"	"	.25	2.25	.25	2.25	"	"	"	"
Schematic H	"	"	.25	1.25	.25	1.25	"	"	"	"
Schematic G	"	"	.14	2.25	.14	2.25	"	"	"	"
Style RZ050 Schematic C	"	"	.25	2.25	.25	2.25	"	"	"	"
Schematic H	"	"	.14	2.25	.14	2.25	"	"	"	"
Schematic G	"	"	.25	1.25	.25	1.25	"	"	"	"
Style RZ060 Schematic C	"	"	.25	2.25	.25	2.25	"	"	"	"
Schematic H	"	"	.14	2.25	.14	2.25	"	"	"	"
Schematic G	"	"	.25	1.25	.25	1.25	"	"	"	"
Style RZ070 Schematic C	.15	.75	.15	.75	.15	.75	"	"	"	"
Schematic H	N/A	N/A	.09	.75	.09	.75	"	"	"	"
Schematic G	.15	.45	.15	.45	.15	.45	"	"	"	"
Style RZ080 Schematic C	.15	1.05	.15	1.05	.15	1.05	"	"	"	"
Schematic H	N/A	N/A	.09	1.05	.09	1.05	"	"	"	"
Schematic G	.15	.60	.15	.60	.15	.60	"	"	"	"
Style RZ090 Schematic C	.15	1.35	.15	1.35	.15	1.35	"	"	"	"
Schematic H	N/A	N/A	.09	1.35	.09	1.35	"	"	"	"
Schematic G	.15	.75	.15	.75	.15	.75	"	"	"	"
Min & Max resistance values	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Style RZ010	100	70 kΩ	10	1 MΩ	10	1 MΩ	1 kΩ	.2 MΩ	100	1 MΩ
Style RZ020	100	70 kΩ	10	1 MΩ	10	1 MΩ	1 kΩ	.2 MΩ	10	1 MΩ
Style RZ030	150	51.5 kΩ	10	1 MΩ	10	1 MΩ				
Style RZ040			10	1 MΩ	10	1 MΩ				
Style RZ050			10	1 MΩ	10	1 MΩ				
Style RZ060			10	1 MΩ	10	1 MΩ				
Style RZ070	100	46.4 kΩ	27	1 MΩ	27	1 MΩ				
Style RZ080	100	46.4 kΩ	27	1 MΩ	27	1 MΩ				
Style RZ090	100	46.4 kΩ	27	1 MΩ	27	1 MΩ				
Max % change resistance 2/										
Thermal shock	±.5 3/		±.7 3/		±.7 3/		±.25 3/		±.25	
Power conditioning	±.5 3/		±.7 3/		±.7 3/		±.25 3/		±.25	
Low temperature operation	±.10		±.25		±.50		±.10		±.10	
Short time overload	±.10		±.25		±.50		±.10		±.10	
Terminal strength	±.25		±.25		±.25		±.10		±.10	
Resistance to soldering heat	±.10		±.25		±.25		±.10		±.10	
Moisture resistance	±.40		±.50		±.50		±.20		±.20	
Shock (specified pulse)	±.25		±.25		±.25		±.25		±.25	
Vibration	±.25		±.25		±.25		±.25		±.25	
Life	±.50		±.50		±.20		±.10		±.10	
High temperature exposure	±.20		±.50		±1.0		±.10		±.10	
Low temperature storage	±.10		±.25		±.50		±.10		±.10	
Insulation resistance	10,000 megohms		10,000 megohms		10,000 megohms		10,000 megohms		10,000 megohms	
Resistance tolerance	± .10% (B)		± .10% (B)		± .10% (B)		± .10% (B)		± .10% (B)	
	± .50% (D)		± .50% (D)		± .50% (D)		± .50% (D)		± .50% (D)	
	±1.0% (F)		±1.0% (F)		±1.0% (F)		±1.0% (F)		±1.0% (F)	
	±2.0% (G)		±2.0% (G)		±2.0% (G)		±2.0% (G)			
	±5.0% (J)		±5.0% (J)		±5.0% (J)		±5.0% (J)			

1/ QPL source not available (N/A).
2/ Where total resistance change is 1 percent or less, it shall be considered as ±(percent ±0.01 ohm).
3/ Maximum percent change for combined thermal shock and power conditioning tests.

SECTION 307

RESISTORS, FIXED, FILM, CHIP, ESTABLISHED RELIABILITY

STYLES RM0502, RM0505, RM1005, RM1505, RM2208, RM0705, RM1206, RM2010, RM2512 AND RM1010

(APPLICABLE SPECIFICATION: MIL-R-55342)

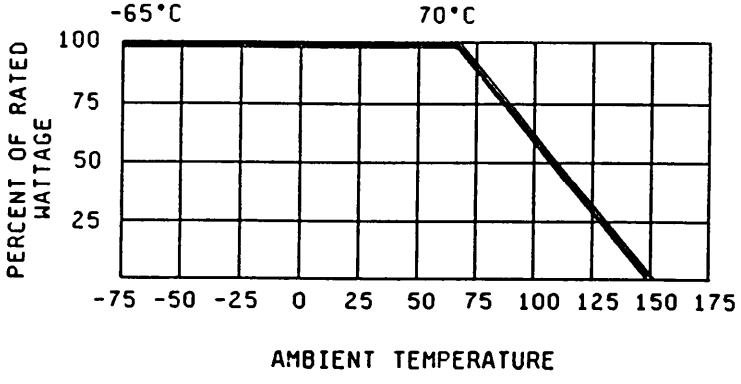
1. SCOPE

1.1 Scope. This section covers established reliability, fixed, film, chip resistors primarily intended for incorporation into hybrid microelectronic circuits. These resistors are uncased, leadless chip devices and possess a high degree of stability with respect to time, under severe environmental conditions. These resistors provide life failure rates ranging from 1.0 percent to 0.001 percent per 1,000 hours. The failure rates are established at a 60-percent confidence level (initial qualification) and maintained at a 10-percent producer's risk. The failure rate is referred to operation at full rated voltage and rated temperature with a maximum change in resistance of ±2.0 percent at 0 to 10,000 hours of life test.

2. APPLICATION INFORMATION

2.1 Construction. The resistance element consists of a film element on a ceramic substrate. The element is formed either by deposition of a vaporized metal or the printing of a metal and glass combination paste which has then been fired at a high temperature. Resistance elements are generally rectangular in shape and calibrated to the proper resistance value by trimming the element by abrasion or a laser beam. Due to the reliability requirements of MIL-R-55342, processes and controls utilized in manufacturing are necessarily more stringent. MIL-STD-790, "Reliability Assurance Program for Electronic Parts Specifications", provides for monitoring and documentation of these requirements.

2.2 Derating at high temperatures. The power rating is based on operation at +70°C. However, when a resistor is to be used in a circuit where the surrounding temperature is higher than +70°C, a correction factor must be applied to the wattage rating so as not to overload the resistor. The correction factor may be taken from the curve shown on figure 307-I.



NOTE: This curve indicates the percentage of nominal wattage to be applied at temperatures higher than +70°C. This curve applies only to units mounted on a substrate; however, the applied voltage does not exceed the maximum for each styles.

FIGURE 307-I. Derating curve for high ambient temperatures.

2.3 Derating for optimum performance. Because all of the electrical energy dissipated by a resistor is converted into heat energy, the temperature of the surrounding air is an influencing factor when selecting a particular resistor a specific application. The power rating of these resistors is based on operation at specific temperatures; however, in actual use, the resistors may not be operating at these temperatures. When the desired characteristic and the anticipated maximum ambient temperatures have been determined, a safety factor of two, applied to the wattage, is recommended in order to insure the selection of a resistor having an adequate wattage-dissipation potential.

2.4 Resistance tolerance. Designers should bear in mind that operation of these resistor chips under the ambient conditions for which mititary equipment is designed may cause permanent or temporary changes in resistance sufficient to exceed their initial tolerances. In particular, operation at extremely high or low ambient temperatures may cause significant temporary changes in resistance.

2.5 Voltage limitations. Because of the very small size of the resistance elements and connecting circuits, there are maximum permissible voltages which are imposed. The maximum voltage permissible for each style is shown in table 307-I.

2.6 Noise. Noise output is not controlled by specification, but for these resistors, noise is a negligible quantity. In applications where noise is an important factor, resistors in these chips are superior to composition types. Where noise test screening is indicated, it is recommended that MIL-STD-202, method 308, be used.

2.7 Moisture resistance. These resistor chips are essentially unaffected by moisture. The specification allows only a 0.5 percent change in resistance value as a result of exposure to a standard 10-day moisture resistance test.

2.8 Electrostatic charge effects. Under relatively low humidity conditions, some types of film resistors, particularly those with small dimensions and high sheet resistivity materials, are prone to sudden significant changes in resistance (usually reductions in value) and to changes in temperature coefficient of resistance as a result of discharge of static charges built up on associated objects during handling, packaging, or shipment. Substitution of more suitable implements and materials can help minimize this problem. For example, use of cotton gloves, static eliminator devices, air humidifiers, and operator and work bench grounding systems can reduce static buildup during handling. Means of alleviating static problems during shipment include elimination of loose packaging of resistors and use of metal foil and antistatic (partly conducting) plastic packaging materials.

2.9 High frequency application. When used in high frequency circuits (200 megahertz and above), the effective resistance will be reduced as a result of shunt capacity between resistance elements and connecting circuits. The high frequency characteristics of these chips are not controlled.

2.10 Mounting. Under severe shock or vibration conditions (or a combination of both), resistors should be mounted so that the body of the resistor chip is restrained from movement with respect to the mounting base. If clamps are used, certain electrical characteristics may be altered. The heat-dissipating qualities will be enhanced or retarded depending on whether the clamping material is a good or poor heat conductor.

2.11 Screening. All resistor chips furnished under MIL-R-55342 are subject to 100 percent screening through a thermal shock test. This test is followed by a total resistance check and a visual examination for evidence of mechanical damage.

2.12 Failure rate factors. Failures are considered to be opens, shorts, or radical departures from initial characteristics occurring in an unpredictable manner, and in too short a period of time to permit detection through normal preventive maintenance. Failure rate factors applicable to this specification are stated in MIL-HDBK-217. The failure rate factors stated in MIL-HDBK-217 are based on “catastrophic failures” and will differ from the failure rates established in the specification, since the established failure rate is based on a “parametric failure” of ±2.0 percent change in resistance to be expected at 0 to 10,000 hours of life tests at rated conditions.

3. ITEM IDENTIFICATION (see figures 307-2 and 307-3).

3.1 PIN. The PIN is used for identifying and describing the resistor as shown on figure 307-2.

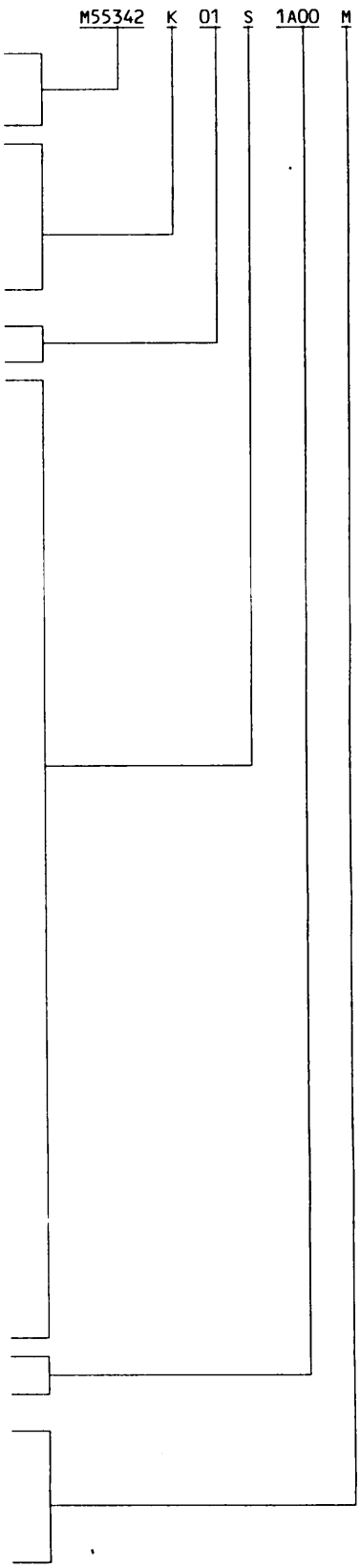
3.2 Resistance values. Resistance values shall follow the decade of values as shown in the following tabulation (see table 307-I).

3.3 Performance characteristics. The performance characteristics of these resistors are as shown in table 307-II.

3.4 Specification number. MIL-R-55342 number identification all began with M55342 except slash sheet 07, which begin with D55342, this is because the dimensions are in metric units.

TABLE 307-I. Resistance values for 10 to 100 decade.

Standard resistance vales for the 10 to 100 decade for 1.0%, 2.0%, 5.0%, and 10.0% resistance tolerance															
F (1.0)	G (2.0) J (5.0)	K (10.0)	F (1.0)	G (2.0) J (5.0)	K (10.0)	F (1.0)	G (2.0) J (5.0)	K (10.0)	F (1.0)	G (2.0) J (5.0)	K (10.0)	F (1.0)	G (2.0) J (5.0)	K (10.0)
10.00	10.00	10.00	17.80	–	–	–	–	–	51.10	–	–	86.60	–	–
–	–	–	–	18.00	18.00	30.90	–	–	–	–	–	–	–	–
10.20	–	–	18.20	–	–	–	–	–	52.30	–	–	88.70	–	–
–	–	–	–	–	–	31.60	–	–	–	–	–	–	–	–
10.50	–	–	18.70	–	–	–	–	–	53.60	–	–	90.90	–	–
–	–	–	–	–	–	32.40	–	–	–	–	–	–	–	–
10.70	–	–	19.10	–	–	–	–	–	54.90	–	–	–	91.00	–
–	–	–	–	–	–	–	33.00	33.00	–	–	–	93.10	–	–
11.00	11.00	–	19.60	–	–	33.20	–	–	–	56.00	56.00	–	–	–
–	–	–	–	–	–	–	–	–	56.20	–	–	95.30	–	–
11.30	–	–	20.00	20.00	–	34.00	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	57.60	–	–	97.60	–	–
11.50	–	–	20.50	–	–	34.80	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	59.00	–	–	–	–	–
11.80	–	–	21.00	–	–	35.70	–	–	–	–	–	–	–	–
–	12.00	12.00	–	–	–	–	36.00	–	60.40	–	–	–	–	–
12.10	–	–	21.50	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	36.50	–	–	61.90	–	–	–	–	–
12.40	–	–	–	22.00	22.00	–	–	–	–	62.00	–	–	–	–
–	–	–	22.10	–	–	37.40	–	–	–	–	–	–	–	–
12.70	–	–	–	–	–	–	–	–	63.40	–	–	–	–	–
–	–	–	22.60	–	–	38.30	–	–	–	–	–	–	–	–
13.00	13.00	–	–	–	–	–	–	–	64.90	–	–	–	–	–
–	–	–	23.20	–	–	–	39.00	39.00	–	–	–	–	–	–
13.30	–	–	–	–	–	39.20	–	–	66.50	–	–	–	–	–
–	–	–	23.70	–	–	–	–	–	–	–	–	–	–	–
13.70	–	–	–	24.00	–	40.20	–	–	–	68.00	68.00	–	–	–
–	–	–	24.30	–	–	–	–	–	68.10	–	–	–	–	–
14.00	–	–	–	–	–	41.20	–	–	–	–	–	–	–	–
–	–	–	24.90	–	–	–	–	–	69.80	–	–	–	–	–
14.30	–	–	–	–	–	42.20	–	–	–	–	–	–	–	–
–	–	–	25.50	–	–	–	–	–	71.50	–	–	–	–	–
14.70	–	–	–	–	–	–	43.00	–	–	–	–	–	–	–
–	–	–	26.10	–	–	43.20	–	–	73.20	–	–	–	–	–
15.00	15.00	15.00	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	26.70	–	–	44.20	–	–	75.00	75.00	–	–	–	–
15.40	–	–	–	27.00	27.00	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	45.30	–	–	76.80	–	–	–	–	–
15.80	–	–	27.40	–	–	–	–	–	–	–	–	–	–	–
–	16.00	–	–	–	–	46.40	–	–	78.70	–	–	–	–	–
16.20	–	–	28.00	–	–	–	47.00	47.00	–	–	–	–	–	–
–	–	–	–	–	–	47.50	–	–	80.60	–	–	–	–	–
16.50	–	–	28.70	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	48.70	–	–	–	82.00	82.00	–	–	–
16.90	–	–	29.40	–	–	–	–	–	82.50	–	–	–	–	–
–	–	–	–	–	–	49.90	–	–	–	–	–	–	–	–
17.40	–	–	–	30.00	–	–	–	–	84.50	–	–	–	–	–
–	–	–	30.10	–	–	–	51.00	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–



Specification number: The number identifies the military specification number (indicating MIL-R-55342) (see table 307-II). For slash sheet 07, the specification number shall be 055342, due to the metric dimensions.

Characteristic: The single-letter symbol identifies the characteristic (see table 307-I) as follows:

K - - - +100 ppm/°C; 70°C maximum ambient termperature at rated wattage
M - - - +300 ppm/°C; 70°C maximum ambient temperature at rated wattage

Detail number: This is the number representing the detail specification (MIL-R-55342/1).

Termination: The single-letter symbol identifies termination material, type termination, and termination area as follows:

Termination material designation

Type	Material	Termination area	Code letters
Solderable Bondable Weldable	Gold	Wrap around One surface Bonding pads	G W P
Solderable	Base metalli -zation barrier metal, solder coated	Wrap around	B
	Pretinned	Wrap around One surface	R S
Bondable weldable	Platinum/ gold	Wrap around One surface	U T
Bondable	Palladium /silver or Platinum/ silver	Wrap around	C
	Palladium /silver or Platinum/ silver	One surface	D

Resistance and resistance tolerance: See tables 307-I and 307-IV.

Life failure rate designation: The single-letter symbol identifies the life failure rate as follows:

M - - - -- 1.0 percent per/1,000 hours
P - - - - - 0.1 percent per/1,000 hours
R - - - - - 0.01 percent per/1,000 hours
S - - - - - 0.001 percent per/1,000 hours

FIGURE 307-2. PIN example.

TABLE 307-II. Performance characteristics.

Features	K	M	E	H
Resistance temperature characteristic, ppm/°C	100	300	25	50
Maximum ambient temperature at rated wattage	+70°C	+70°C	+70°C	+70°C
Maximum ambient temperature at zero power DC rating	+150°C	+150°C	+150°C	+150°C
Maximum operating voltage for each resistor (volts)				
M55342/1	40	40	40	40
M55342/2	40	40	40	40
M55342/3	40	40	40	40
M55342/4	40	40	40	40
M55342/5	40	40	40	40
M55342/6	50	50	50	50
D55342/7	100	100	100	100
M55342/8	150	150	150	150
M55342/9	200	200	200	200
M55342/10	40	40	40	40
Power rating (watts) at +70°C:				
M55342/1	.020	.020	.010	.010
M55342/2	.050	.050	.025	.250
M55342/3	.100	.100	.050	.050
M55342/4	.150	.150	.100	.100
M55342/5	.225	.225	.200	.200
M55342/6	.100	.100	.050	.050
D55342/7	.250	.250	.125	.125
M55342/8	.800	.800	.500	.500
M55342/9	1.000	1.000	.500	.500
M55342/10	.500	.500	.250	.250
Maximum percent change in resistance (0.01 ohm additional allowed for measurement error):				
Thermal shock 1/	.5%	.5%	.1%	.25%
Low temperature operation	.25%	.5%	.1%	.25%
Short time overload	.25%	.5%	.1%	.1%
High temperature exposure	.5%	1.0%	.1%	.2%
Resistance to bonding exposure	.25%	.25%	.2%	.25%
Moisture resistance	.5%	.5%	.2%	.4%
Life (2,000 hours)	.5%	2.0%	.5%	.5%

See footnote at end of table.

TABLE 307-II. Performance characteristics - Continued.

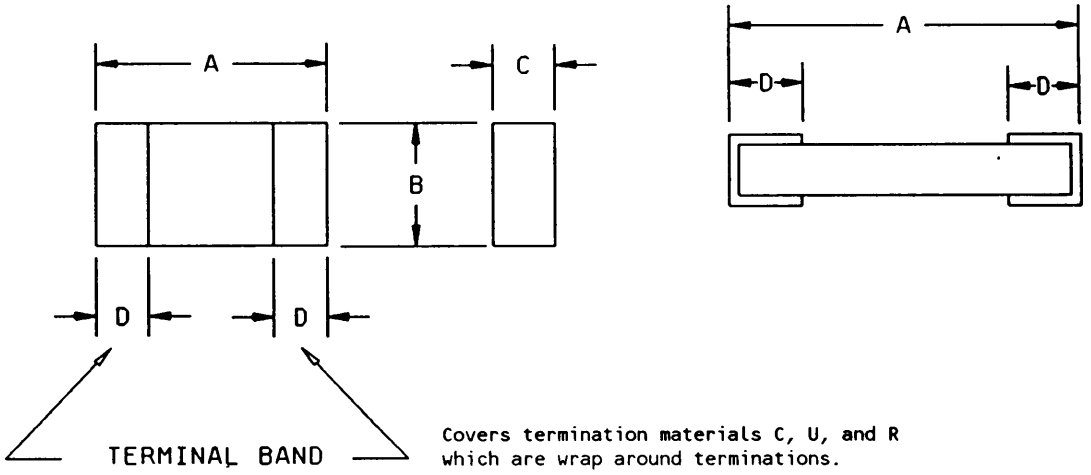
Minimum and maximum resistance values (ohms):	Minimum	Maximum
M55342/1		
Resistance tolerance B	100	0.1 MΩ
Resistance tolerance F	5.62	0.1 MΩ
Resistance tolerance G	5.6	0.1 MΩ
Resistance tolerance J	5.6	0.1 MΩ
Resistance tolerance K	5.6	0.1 MΩ
M55342/2		
Resistance tolerance B	100	0.2 MΩ
Resistance tolerance F	5.62	0.475 MΩ
Resistance tolerance G	5.6	0.47 MΩ
Resistance tolerance J	5.6	0.47 MΩ
Resistance tolerance K	5.6	0.47 MΩ
M55342/3		
Resistance tolerance B	100	.3 MΩ
Resistance tolerance F	5.62	1.0 MΩ
Resistance tolerance G	5.6	1.0 MΩ
Resistance tolerance J	5.6	1.0 MΩ
Resistance tolerance K	5.6	1.0 MΩ
M55342/4		
Resistance tolerance B	100	0.5 MΩ
Resistance tolerance F	5.62	4.75 MΩ
Resistance tolerance G	5.6	4.7 MΩ
Resistance tolerance J	5.6	4.7 MΩ
Resistance tolerance K	5.6	4.7 MΩ
M55342/5		
Resistance tolerance B	100	1.0 MΩ
Resistance tolerance F	5.62	15.0 MΩ
Resistance tolerance G	5.6	15.0 MΩ
Resistance tolerance J	5.6	15.0 MΩ
Resistance tolerance K	5.6	15.0 MΩ
M55342/6		
Resistance tolerance B	100	0.3 MΩ
Resistance tolerance F	5.62	1.0 MΩ
Resistance tolerance G	5.6	1.0 MΩ
Resistance tolerance J	5.6	1.0 MΩ
Resistance tolerance K	5.6	1.0 MΩ
D55342/7		
Resistance tolerance B	100	0.5 MΩ
Resistance tolerance F	5.62	5.62 MΩ
Resistance tolerance G	5.6	5.6 MΩ
Resistance tolerance J	5.6	5.6 MΩ
Resistance tolerance K	5.6	5.6 MΩ
M55342/8		
Resistance tolerance B	100	4.99 MΩ
Resistance tolerance F	5.62	15.0 MΩ
Resistance tolerance G	5.6	15.0 MΩ
Resistance tolerance J	5.6	15.0 MΩ
Resistance tolerance K	5.6	15.0 MΩ

See footnote at end of table.

TABLE 307-II. Performance characteristics - Continued.

Minimum and maximum resistance values (ohms):	Minimum	Maximum
M55342/9		
Resistance tolerance B	100	4.99 MΩ
Resistance tolerance F	5.62	15.0 MΩ
Resistance tolerance G	5.6	15.0 MΩ
Resistance tolerance J	5.6	15.0 MΩ
Resistance tolerance K	5.6	15.0 MΩ
M55342/10		
Resistance tolerance B	100.0	5.6 MΩ
Resistance tolerance F	5.62	5.62 MΩ
Resistance tolerance G	5.6	5.6 MΩ
Resistance tolerance J	5.6	5.6 MΩ
Resistance tolerance K	5.6	5.6 MΩ

1/ Maximum ambient temperature is +150°C.



Covers termination materials S, W, D, and T.
* Also applicable to termination C, U, and R.

Termination material designation			
Type	Material	Termination area	Code letters
Solderable 1/ Bondable Weldable	Gold	Wrap around 2/ One surface Bonding pads	G W 3/ P
Solderable 1/	Base metallization barrier metal, solder coated nickel	Wrap around 2/	B 5/
	Pretinned	Wrap around One surface	R 4/ S 3/
Bondable Weldable	Platinum, gold	One surface Wrap around	T U
Bondable	Platinum, silver	Wrap around 2/ One surface	K M 3/
	Palladium, silver	Wrap around One surface	C D 3/

1/ Solderable or weldable terminations will meet the solderability test. Solderable terminations will be pretinned for solder reflow operation and will meet the solderability test.
2/ On wrap around termination, the pretinning will be, as a minimum, on at least two sides and only those surfaces must meet the solderability test. Wrap around type will be illustrated on detail specifications.
3/ See 6.4.4.
4/ Inactive for new design.
5/ For B termination base metallization barrier metal is 50 microinches of nickel.

FIGURE 307-3. Established reliability, fixed film chip resistors.

TABLE 307-III. Available styles. 1/

Specification number	Termination	Dimension (inches)				Style
		A	B	C	D	
MIL-R-55342/1	B, R, G	.050 +.025 -.005	.025 +.010 -.005	.010/.040	.016 ±.001	RM0502
	C, U	.050 +.011 -.005			.015 +.001 -.005	
	S, W, D, T	.050 2/			.010 2/	
MIL-R-55342/2	B, R, G	.050 +.025 -.005	.050 +.010 -.005	.010/.040	.016 ±.011	RM0505
	C, U	.050 +.011 -.005			.015 +.005 -.010	
	S, W, D, T	.050 2/			.010 2/	
MIL-R-55342/3	B, R, G	.100 +.025 -.005	.050 +.010 -.005	.010/.040	.021 ±.011	RM1005
	C, U	.100 +.011 -.005			.017 +.008 -.007	
	S, W, D, T	.100 2/			.015 2/	
MIL-R-55342/4	B, R, G	.150 +.025 -.005	.050 +.010 -.005	.010/.040	.021 ±.011	RM1505
	C, U	.150 +.011 -.005			.017 +.008 -.007	
	S, W, D, T	.150 2/			.015 2/	
MIL-R-55342/5	B, R, G	.225 +.025 -.005	.075 +.010 -.005	.010/.040	.022 +.013 -.012	RM2208
	C, U	.225 +.011 -.005			.020 ±.010	
	S, W, D, T	.225 2/			.015 2/	
MIL-R-55342/6	B, R, G	.075 +.025 -.005	.050 +.010 -.005	.010/.040	.021 ±.011	RM0705
	C, U	.075 +.011 -.005			.017 +.008 -.007	
	S, W, D, T	.075 2/			.015 2/	

See footnotes at end of table.

TABLE 307-III. Available styles - Continued. 1/

Specification number	Termination	Dimension (inch)				Style
		A	B	C	D	
MIL-R-55342/7 (metric)	B, R, G	3.45 +0.41 -0.13	1.60 mm +.250 -.150	1.00 mm (max)	.51 ±0.25	RM1206 3/
	C, U	3.45 ±0.41			.51 ±0.25	
	S, W, D, T	3.20 mm 2/			.35 mm 2/	
MIL-R-55342/8	B, R, G	.206 ±.015	.098 +.010 -.006	.039 (max)	.019 ±.010	RM2010
	C, U	.206 ±.015			.019 ±.010	
	S, W, D, T	.206 2/			.013 2/	
MIL-R-55342/9	B, R, G	.256 ±.015	.124 +.010 -.006	.039 (max)	.019 ±.010	RM2512
	C, U	.256 ±.015			.019 ±.010	
	S, W, D, T	.248 2/			.013 2/	
MIL-R-55342/10	B, R, G	.100 ±.010	.100 2/	.020 (max)	.017 ±.008	RM1010
	C, U	.100 ±.010			.017 ±.008	
	S, W, D, T	.100 ±.010			.017 ±.008	

1/ The pictorial views of the styles above are given as representative of the envelope of the item. Slight deviations from the outline shown are acceptable.
2/ Tolerance is ±.005 (±0.13 mm).
3/ Style RM1206 is a metric chip resistor, these dimensions are marked in millimeters.

TABLE 307-IV. Designation of resistance values for resistance at all available tolerance.

Designation for .1 percent tolerance	Resistance ohms
1A00 to 9A88 inclusive	1.00 to 9.88 inclusive
10A0 to 98A8 inclusive	10.0 to 98.8 inclusive
100A to 988A inclusive	100 to 988 inclusive
1B00 to 9B88 inclusive	1,000 to 9,880 inclusive
10B0 to 98B8 inclusive	10,000 to 98,800 inclusive
100B to 988B inclusive	100,000 to 988,000 inclusive
1C00 to 9C88 inclusive	1,000,000 to 9,880,000 inclusive
10C0	10,000,000
Designation for 1 percent tolerance	**Resistance ohms**
1D00 to 9D76 inclusive	1.00 to 9.76 inclusive
10D0 to 97D6 inclusive	10.0 to 97.6 inclusive
100D to 976D inclusive	100 to 976 inclusive
1E00 to 9E76 inclusive	1,000 to 9,760 inclusive
10E0 to 97E6 inclusive	10,000 to 97,600 inclusive
100E to 976E inclusive	100,000 to 976,000 inclusive
1F00 to 9F76 inclusive	1,000,000 to 9,760,000 inclusive
10F0	10,000,000
Designation for 2 percent tolerance	Resistance ohms
1G00 to 9G10 inclusive	1.00 to 9.10 inclusive
10G0 to 91G0 inclusive	10.0 to 91.0 inclusive
100G to 910G inclusive	100 to 910 inclusive
1H00 to 9G10 inclusive	1,000 to 9,100 inclusive
10H0 to 91G0 inclusive	10,000 to 91,000 inclusive
100H to 910G inclusive	100,000 to 910,000 inclusive
1T00 to 9T10 inclusive	1,000,000 to 9,100,000 inclusive
10T0	10,000,000
Designation for 5 percent tolerance	**Resistance ohms**
1J00 to 9J10 inclusive	1.00 to 9.10 inclusive
10J0 to 91J0 inclusive	10.0 to 91.0 inclusive
100J to 910J inclusive	100 to 910 inclusive
1K00 to 9K10 inclusive	1,000 to 9,100 inclusive
10K0 to 91K0 inclusive	10,000 to 91,000 inclusive
100K to 910K inclusive	100,000 to 910,000 inclusive
1L00 to 9L10 inclusive	1,000,000 to 9,100,000 inclusive
10L0	10,000,000
Designation for 10 percent tolerance	**Resistance ohms**
1M00 to 8M20 inclusive	1.00 to 8.20 inclusive
10M0 to 82M0 inclusive	10.0 to 82.0 inclusive
100M to 820M inclusive	100 to 820 inclusive
1N00 to 8N20 inclusive	1,000 to 8,200 inclusive
10N0 to 82N0 inclusive	10,000 to 82,000 inclusive
100N to 820N inclusive	100,000 to 820,000 inclusive
1P00 to 8P20 inclusive	1,000,000 to 8,200,000 inclusive
10P0	10,000,000

SECTION 504

RESISTOR NETWORKS, FIXED, FILM, SURFACE MOUNTED

STYLES RNSO1O, RNS020, RNS030, RNS040, AND RNS050

(APPLICABLE SPECIFICATION: MIL-R-914)

1. SCOPE

1.1 Scope. This section covers the requirements for hermetically and nonhermetically sealed networks. These networks consist of fixed, film, surface mount resistors. They are primarily intended for use in surface applications where space is a major concern. Resistors have a life failure rates ranging from 1 percent to 0.001 percent per 1000 hours.

2. APPLICATION INFORMATION

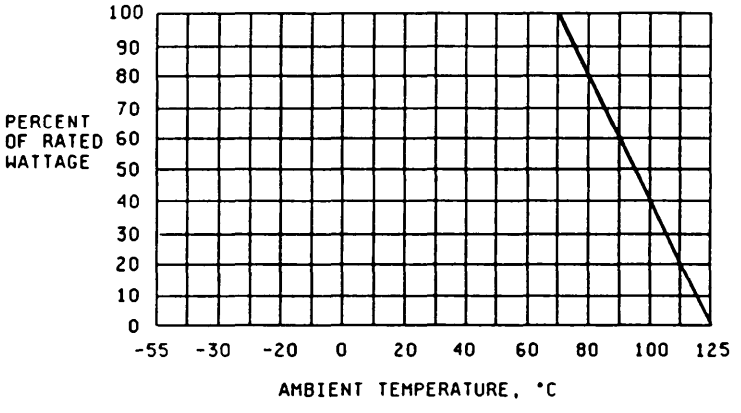
2.1 Style selection.

2.1.1 Construction.

HERMETIC SEALED: A sealed network capable of passing the seal test or meeting a leak rate requirement of not more than 5.0×10^{-7} cubic centimeters per second. Materials used for shall be ceramic, metal, glass, or combinations thereof. Internal construction shall consist of a die and wire bonds. Characteristic C networks may be furnished against H, K, M, R, and V requirements.

NONHERMETIC SEALED: A sealed network not conforming to the requirements of a hermetic sealed network. Characteristic H, K, M, R, and V networks shall not be furnished against characteristic C requirements.

2.1.2 Power rating. The networks and individual resistors shall have a power rating based on continuous full-load operation at an ambient temperature of 70°C. For temperature other than 70°C, the power rating shall be in accordance with figure 504-I.



NOTE: This curve indicates the percentage of nominal wattage to be at temperatures other than 70°C. However, at no time shall the applied voltage exceed the maximum for each style.

FIGURE 504-1 Derating curve.

2.1.3 Derating for optimum performance. Because all the electrical energy dissipated by a resistor is converted into heat energy, temperature of the surrounding area is an influencing factor when selecting a particular resistor network for a specific application. The power rating of these resistor networks is based on operating at specific temperatures. However, in actual use, a resistor network may not be operating at these temperatures. When a desired characteristic and an anticipated maximum ambient temperature have been determined, a safety factor of two applied to the wattage is recommended to insure the selection of a resistor network with an adequate wattage-dissipation potential.

2.2 Resistance tolerance. Designers should bear in mind that operation of these resistor networks under the ambient conditions for which military equipment is designed may cause permanent or temporary changes in resistance sufficient to exceed their initial tolerances. In particular, operation at extremely high or low ambient temperatures may cause significant temporary changes in resistance.

2.3 Voltage rating. Each resistor element shall have a dc continuous working voltage or an approximate sine-wave root-mean-square (rms) continuous working voltage corresponding to the wattage (power) rating, as determined from the following formula:

$$E = \sqrt{PR}$$

E = Continuous rated dc or rms working voltage in volts.
P = Rated wattage in watts.
R = Nominal resistance in ohms.

In no case shall the rated voltage be greater than the applicable maximum voltage.

2.4 Noise. Noise output is not controlled by specification, but for these resistor types, noise is a negligible quantity. In an application where noise is an important factor, resistor in these networks are superior to composition types. Where noise test screening is indicated, it is recommended that MIL-STD-202, method 308, be used.

2.5 Moisture resistance. The resistors within the networks are essentially unaffected by moisture. The specification allows only a 0.5 percent change in resistance value as a result exposure to a standard 10 day moisture resistance test.

2.6 High frequency application. When used in high frequency circuits (200 megahertz and above), the effective resistance will be reduced as a result of shunt capacity between resistance elements and connecting circuits. The high frequency characteristics of these networks are not controlled.

2.7 Mounting. Under severe shock or vibration conditions (or a combination of both), resistors shall be mounted so that the body of the resistor network is restrained from movement with respect to the mounting base. If clamps are used, certain electrical characteristics may be altered. The heat-dissipating qualities will be enhanced or retarded depending on whether the clamping material is a good or poor heat conductor.

2.8 Screening. All resistor networks furnished under MIL-R-914 are subject to 100 percent screening through a 100-hour overload test plus a thermal shock test. These tests are followed by a total resistance check and a visual examination for evidence of arcing, burning, or charring.

3. ITEM IDENTIFICATION (see figure 504-2).

3.1 PIN designation. The PIN designation is used for identifying and describing the resistor as shown on figure 504-2.

3.2 Resistance values. Resistance values shall follow the decade of values as shown in the following tabulation (see table 504-I).

3.3 Performance characteristics. Performance characteristics are shown in table 504-II.

3.4 Styles RNSO1O, RNS020, RNS030, RNS040, and RNS050. See figures 504-3, 504-4, and 504-5.

TABLE 504-I. Resistance values for the 10 to 100 decade.

Standard resistance values for the 10 to 100 decade for 0.1%, 0.5%, 1.0%, 2.0% and 5.0% resistance tolerance.																	
Resistance tolerance																	
B (0.1) D (0.5)	F (1.0)	G (2.0) J (5.0)	B (0.1) D (0.5)	F (1.0)	G (2.0) J (5.0)	B (0.1) D (0.5)	F (1.0)	G (2.0) J (5.0)	B (0.1) D (0.5)	F (1.0)	G (2.0) J (5.0)	B (0.1) D (0.5)	F (1.0)	G (2.0) J (5.0)	B (0.1) D (0.5)	F (1.0)	G (2.0) J (5.0)
10.00	10.00	10.00	15.00	15.00	15.00	22.30			32.80			47.00		47.00			68.00
10.10			15.20			22.60	22.60				33.00	47.50	47.50		68.10	68.10	
10.20	10.20		15.40	15.40		22.90			33.20	33.20		48.10			69.00		
10.40			15.60			23.20	23.20		33.60			48.70	48.70		69.80	69.80	
10.50	10.50		15.80	15.80		23.40			34.00	34.00		49.30			70.60		
10.60			16.00		16.00	23.70	23.70		34.40			49.90	49.90		71.50	71.50	
10.70	10.70		16.20	16.20		24.00		24.00	34.80	34.80		50.50			72.30		
10.90			16.40			24.30			35.20					51.00	73.20	73.20	
11.00	11.00	11.00	16.50	16.50		24.60	24.60		35.70	35.70		51.10	51.10		74.10		
11.10			16.70			24.90					36.00	51.70			75.00	75.00	75.00
11.30	11.30		16.90	16.90		25.20	25.20		36.10			52.30	52.30		75.90		
11.40			17.20			25.50			36.50	36.50		53.00			76.80	76.80	
11.50	11.50		17.40	17.40		25.80	25.80		37.00			53.60	53.60		77.70		
11.70			17.60			26.10			37.40	37.40		54.20			78.70	78.70	
11.80	11.80		17.80	17.80		26.40			37.90			54.90	54.90		79.60		
12.00		12.00	18.00		18.00	26.70	26.70		38.30	38.30		55.60			80.60	80.60	
12.10	12.10		18.20	18.20				27.00	38.80					56.00	81.60		
12.30			18.40			27.10					39.00	56.20	56.20				82.00
12.40	12.40		18.70	18.70		27.40	27.40		39.20	39.20		56.90			82.50	82.50	
12.60			18.90			27.70			39.70			57.60	57.60		83.50		
12.70	12.70		19.10	19.10		28.00	28.00		40.20	40.20		58.30			84.50	84.50	
12.90			19.30			28.40			40.70			59.00	59.00		85.60		
13.00	13.00	13.00	19.60	19.60		28.70	28.70		41.20	41.20		59.70			86.60	86.60	
13.20			19.80			29.10			41.70			60.40	60.40		87.60		
13.30	13.30		20.00	20.00	20.00	29.40	29.40		42.20	42.20		61.20			88.70	88.70	
13.50			20.30			29.80			42.70			61.90	61.90		89.80		
13.70	13.70		20.50	20.50				30.00			43.00			62.00	90.90	90.90	
13.80			20.80			30.10	30.10		43.20	43.20		62.60					91.00
14.00	14.00		21.00	21.00		30.50			43.70			63.40	63.40		92.00		
14.20			21.30			30.90	30.90		44.20	44.20		64.20			93.10	93.10	
14.30	14.30		21.50	21.50		31.20			44.80			64.90	64.90		94.20		
14.50			21.80			31.60	31.60		45.30	45.30		65.70			95.30	95.30	
14.70	14.70				22.00	32.00			45.90			66.50	66.50		96.50		
14.90			22.10	22.10		32.40	32.40		46.40	46.40		67.30			97.60	97.60	
															98.80		

M914 A 01 H 1002 F A S

Specification number: The number identifies the military specification (indicating MIL-R-914).

Termination: The termination material is identified by single letter as specified.

Type	Material 1/	Termination area 2/	Code letters
Solderable	Gold	Wrap around	A
		One surface	B
		Leaded 3/	C
	Tin lead	Wrap around	D
		One surface	E
		Leaded 3/	F
	Hot solder dip 4/	Wrap around	G
		One surface	H
		Leaded 3/	J

1/ Base metals are as specified in MIL-STD-1276.
2/ A nickel barrier to be placed between base metal and lead finish with a minimum thickness of 50 microinches.
3/ Applicable to styles RNS10 and RNS20.
4/ Type 52 of MIL-STD-1276, maximum thickness of 200 microinches is not applicable.

Detail specification number: The number identifies the detail specification number (indicating MIL-R-914/1 through /5).

Characteristic: The single-letter symbol identifies the characteristic (at +70°C maximum ambient temperature at rated wattage) as follows:

R - - - ±25 ppm/°C
C - - - ±50 ppm/°C
V - - - ±50 ppm/°C
H - - - ±50 ppm/°C
K- - - - ±100 ppm/°C
M- - - ±300 ppm/°C

Resistance: The nominal resistance is identified by four digits; the first three digits represent significant figures and the last digit specifies the number of zeros to follow. For values less than 100 ohms, all digits are significant with the letter "R" representing the decimal point.

Example:

10R0 - - - - 10 ohms
1000 - - - - 100 ohms
1001 - - - - 1,000 ohms
1002 - - - - 10,000 ohms
1003 - - - - 100,000 ohms
1004 - - - -1,000,000 ohms

Standard resistance values: The standard resistance values and the resistance designators for the "J" and "S" schematic are as specified.

Resistance designator	R_1 (ohms)	R_2 (ohms)	Resistance designator	R_1 (ohms)	R_2 (ohms)
A001	82	130	A010	330	470
A002	120	200	A011	330	680
A003	130	210	A012	1.5 k	3.3 k
A004	160	260	A013	3.0 k	6.2 k
A005	180	240	A014	180	270
A006	180	390	A015	270	270
A007	220	270	A016	560	560
A008	220	330	A017	560	1.2 k
A009	330	390	A018	620	2.7 k

Resistance tolerance: The single letter symbol identifies the resistance tolerance as follows:

B - - - ±0.1
D - - - ±0.5
F - - - ±1.0
G - - - ±2.0
J - - - ±5 .0

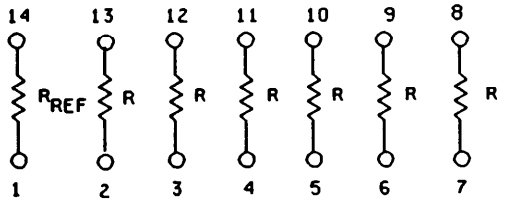
Schematic: The single-letter symbol identifies the resistor network schematic in accordance with the drawings below.

Failure rate level: The single-letter identifies the failure-rate level as follows: Failure rate percent/1,000 hours)

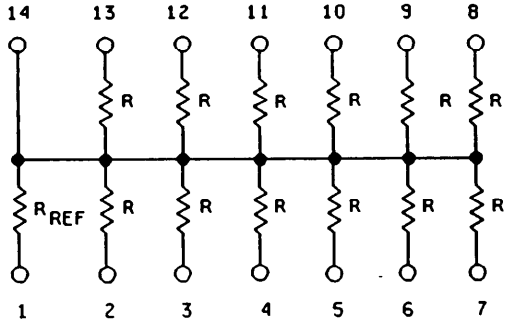
M ---- 1.0
P ---- 0.1
R - - - - 0.01
S - - - - 0.001

FIGURE 504-2. PIN example.

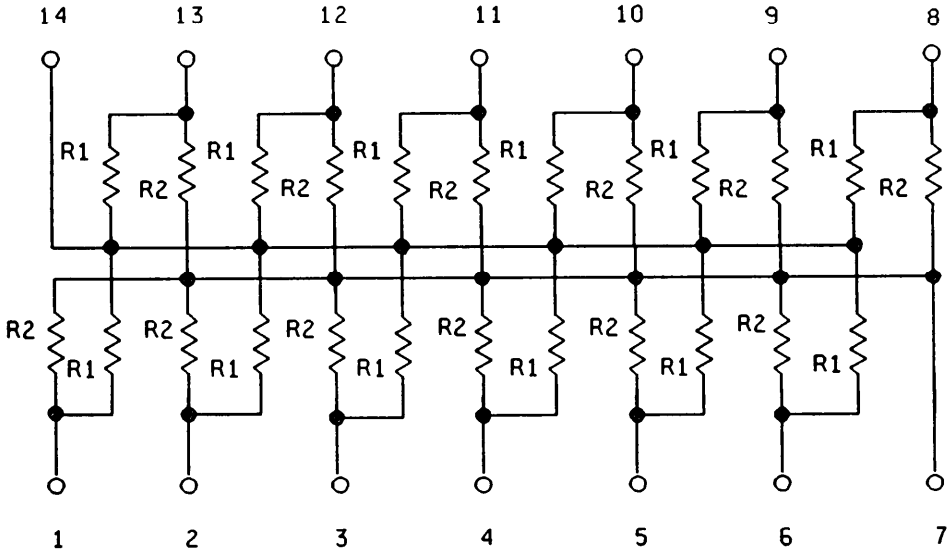
STYLE RNS010



SCHEMATIC "A"



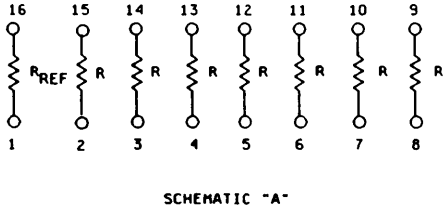
SCHEMATIC "B"



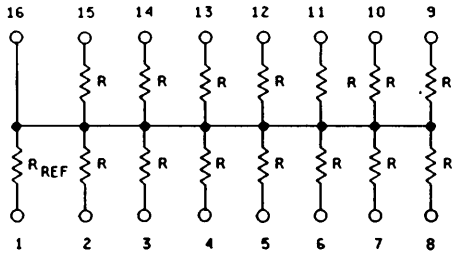
SCHEMATIC "J"

FIGURE 504-3. Schematics.

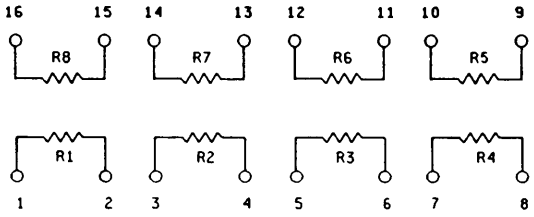
STYLE RNS020



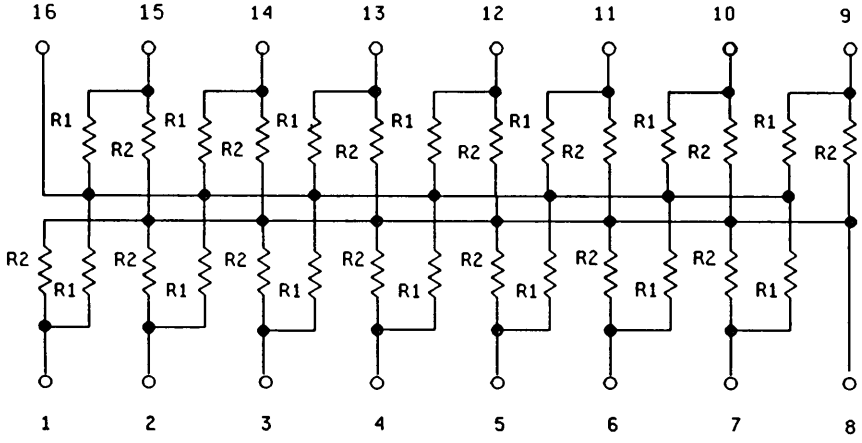
SCHEMATIC "A"



SCHEMATIC "B"



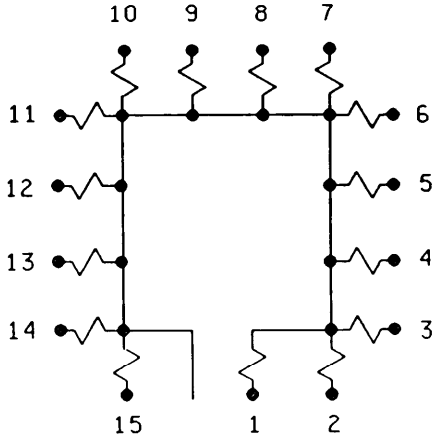
SCHEMATIC "C"



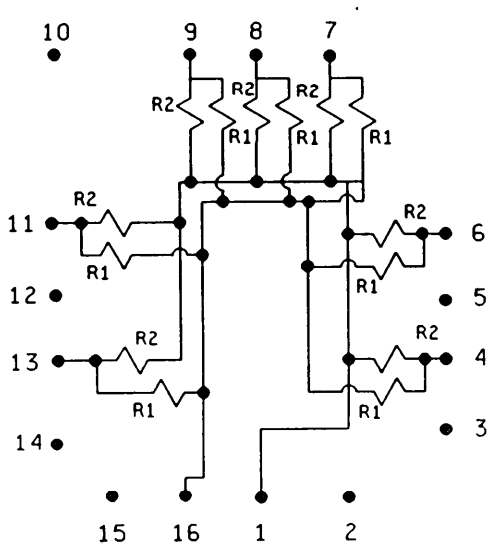
SCHEMATIC "J"

FIGURE 504-3. Schematics - Continued.

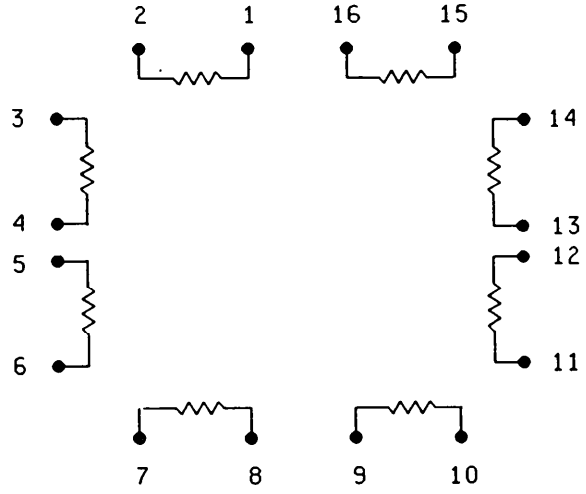
STYLE RNS030



SCHEMATIC "M"



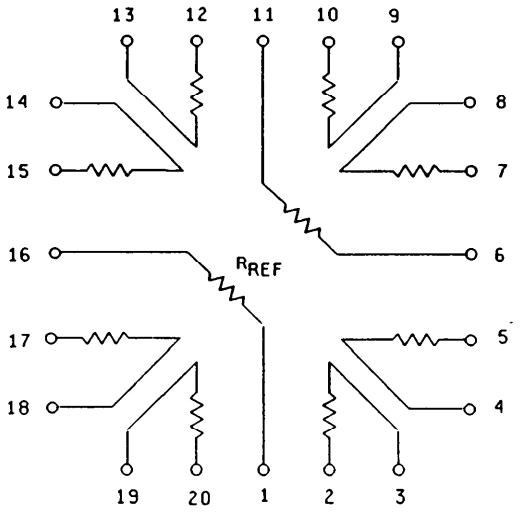
SCHEMATIC "S"



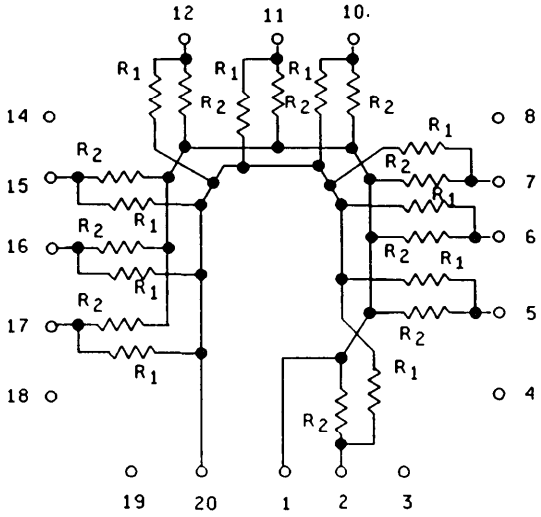
SCHEMATIC "W"

FIGURE 504-3. Schematics - Continued.

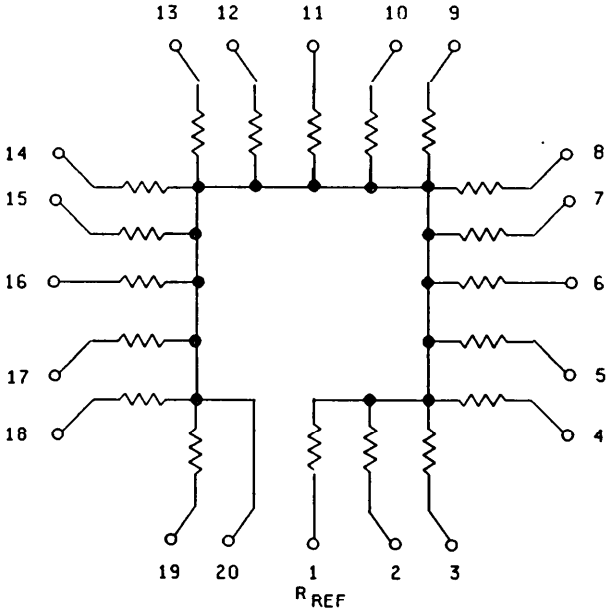
STYLE RNS040



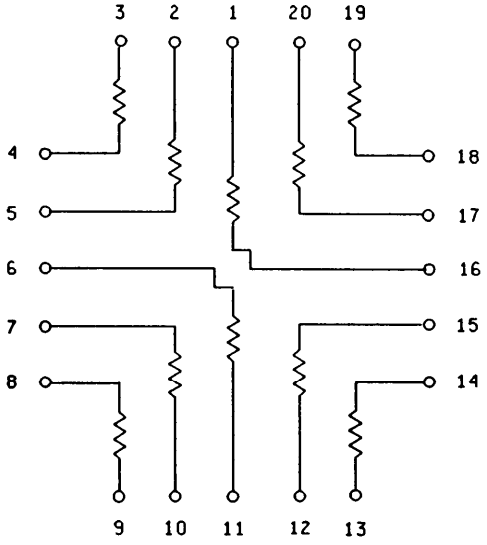
SCHEMATIC "P"



SCHEMATIC "S"



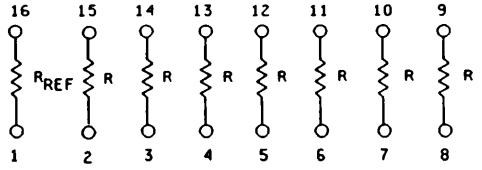
SCHEMATIC "M"



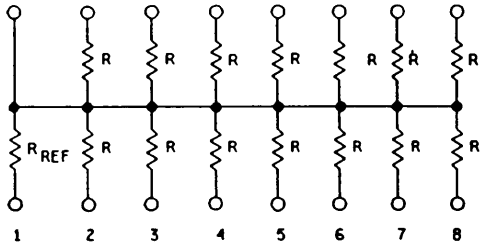
SCHEMATIC "E"

FIGURE 504-3. Schematics - Continued.

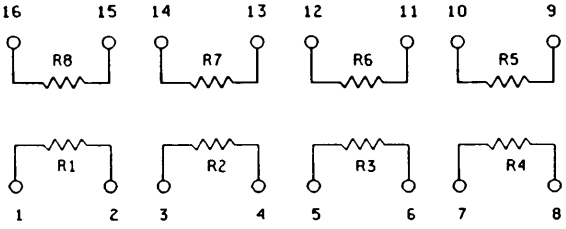
STYLE RNS050



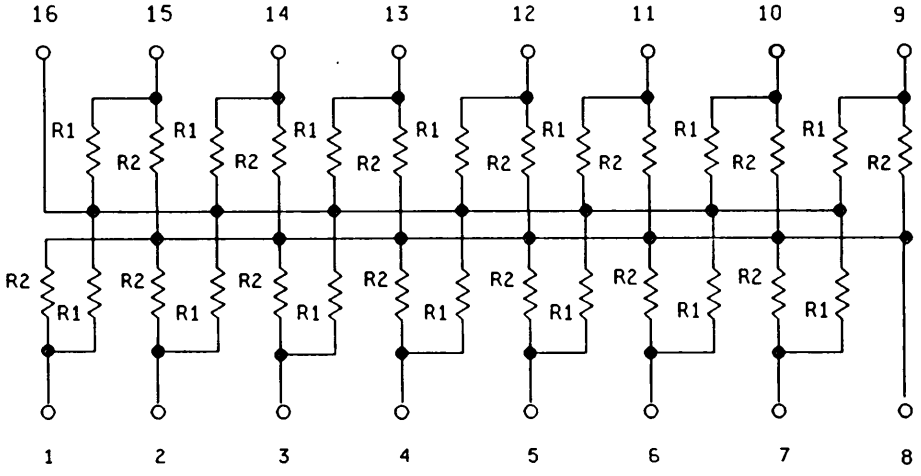
SCHEMATIC "A"



SCHEMATIC "B"



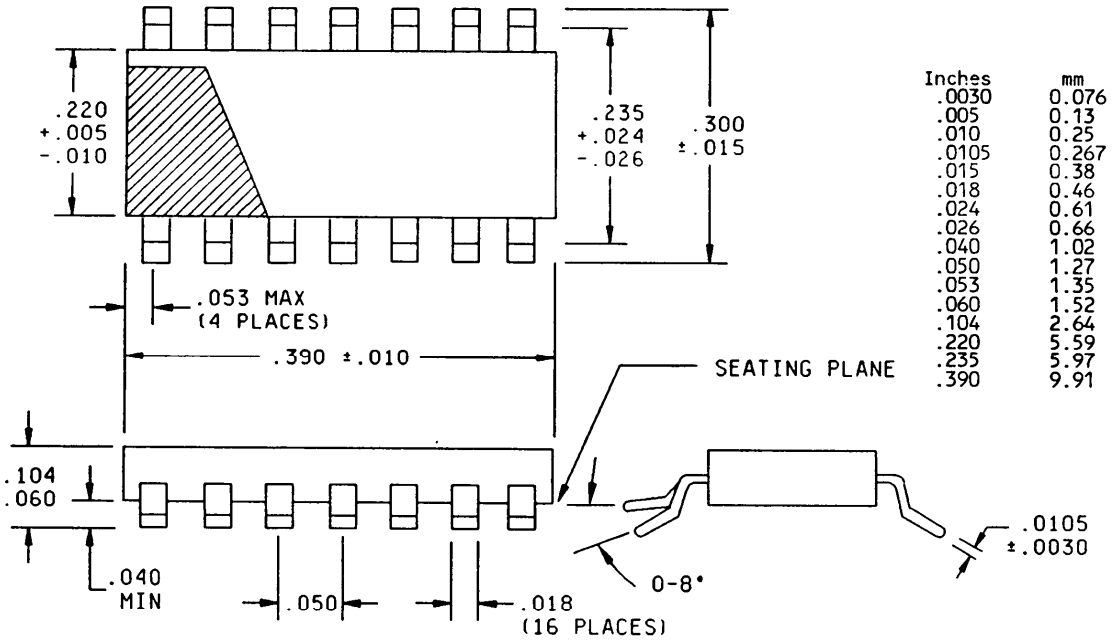
SCHEMATIC "C"



SCHEMATIC "J"

FIGURE 504-3. Schematics - Continued.

STYLE RNS010

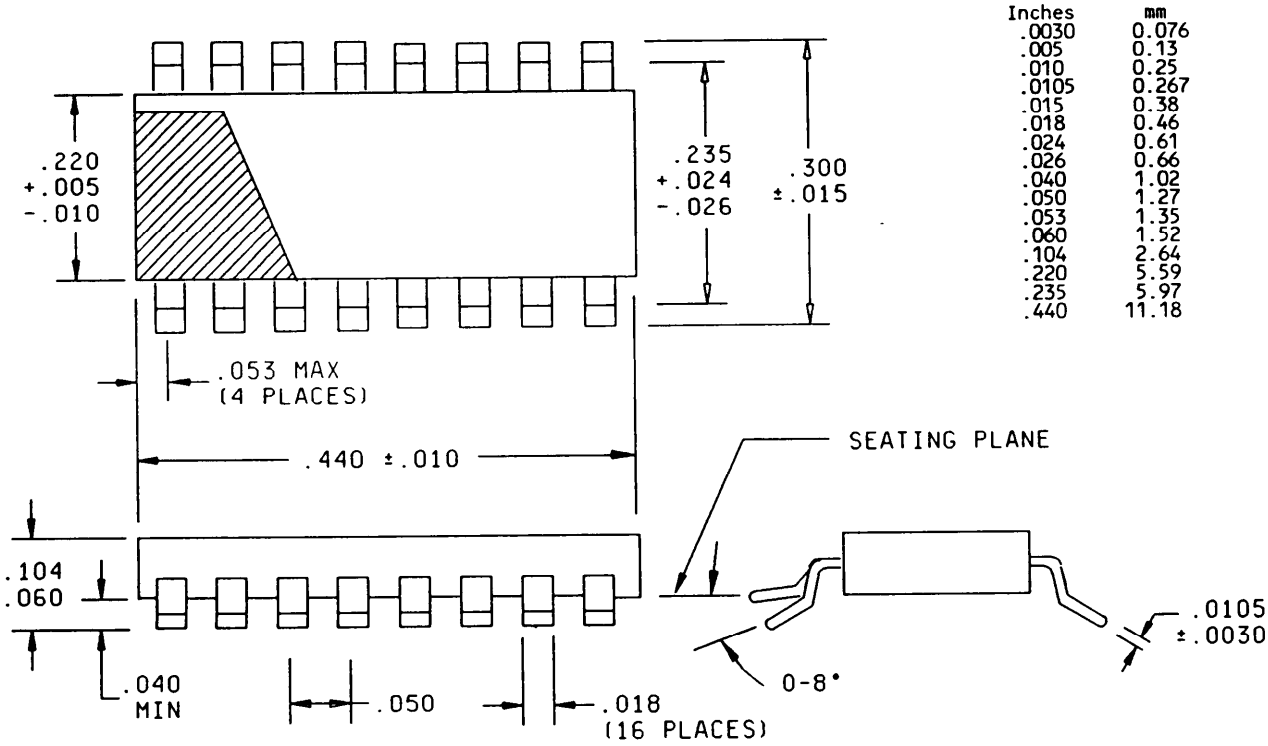


NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.005 (0.13 mm) for three place decimals.
4. Pin 1 locator shall be a dot, stripe, notch, or numeral 1 adjacent to pin number 1, in the shaded area.
5. The picturization of the styles above is given as representative of the envelope of the item. Slight deviations from the outline shown, which are contained within the envelope and do not alter the functional aspect of the device are acceptable.

504 (MIL-R-914)

FIGURE 504-4. Resistor networks.

STYLE RSN020



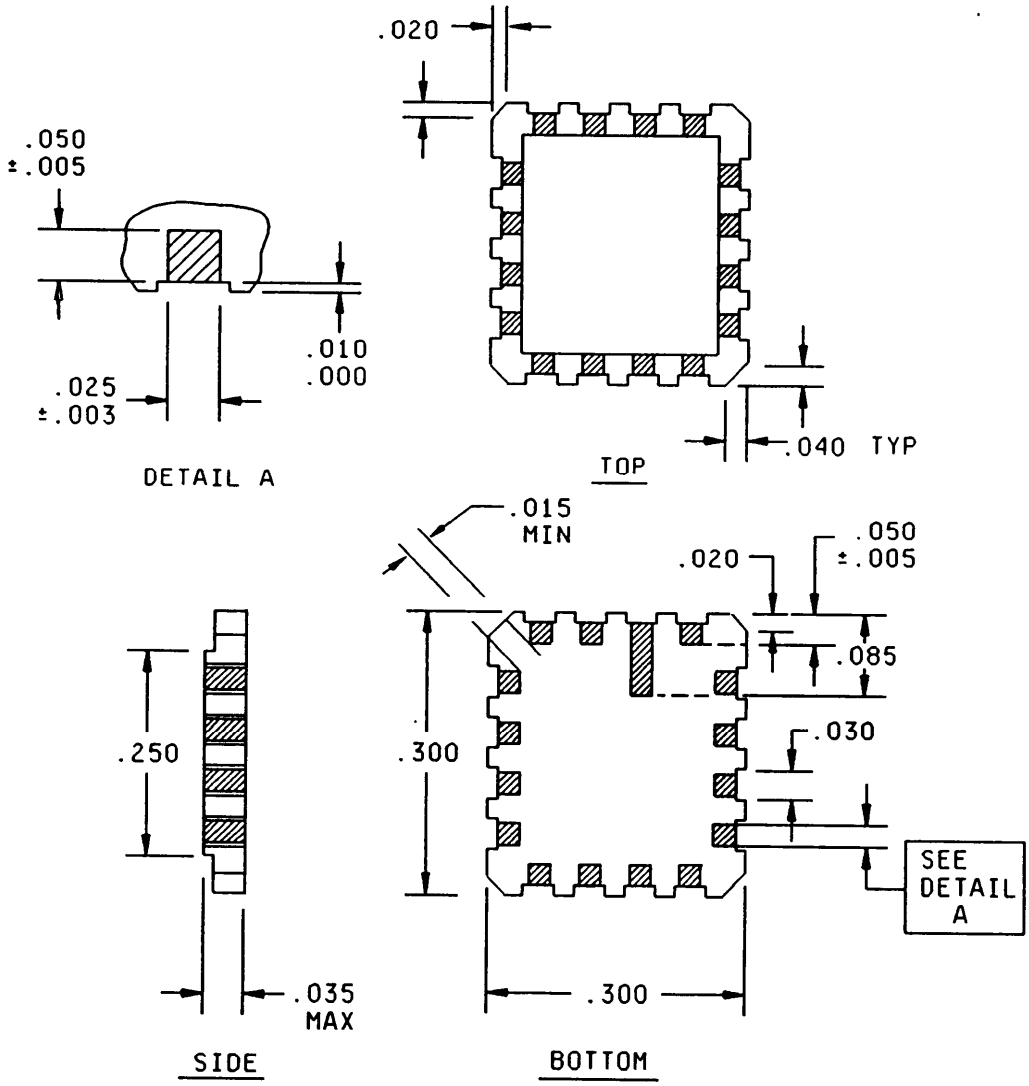
Inches	mm
.0030	0.076
.005	0.13
.010	0.25
.0105	0.267
.015	0.38
.018	0.46
.024	0.61
.026	0.66
.040	1.02
.050	1.27
.053	1.35
.060	1.52
.104	2.64
.220	5.59
.235	5.97
.440	11.18

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.005 (0.13 mm) for three place decimals.
4. Pin 1 locator shall be a dot stripe, notch, or numeral 1 adjacent to pin number 1, in the shade area. The picturization of the styles above is given as representative of the envelope of the item. Slight deviations from the outline shown, which are contained within the envelope and do not alter the functional aspect of the device are acceptable.

FIGURE 504-4. Resistor networks - Continued.

STYLE RNS030

Configuration A

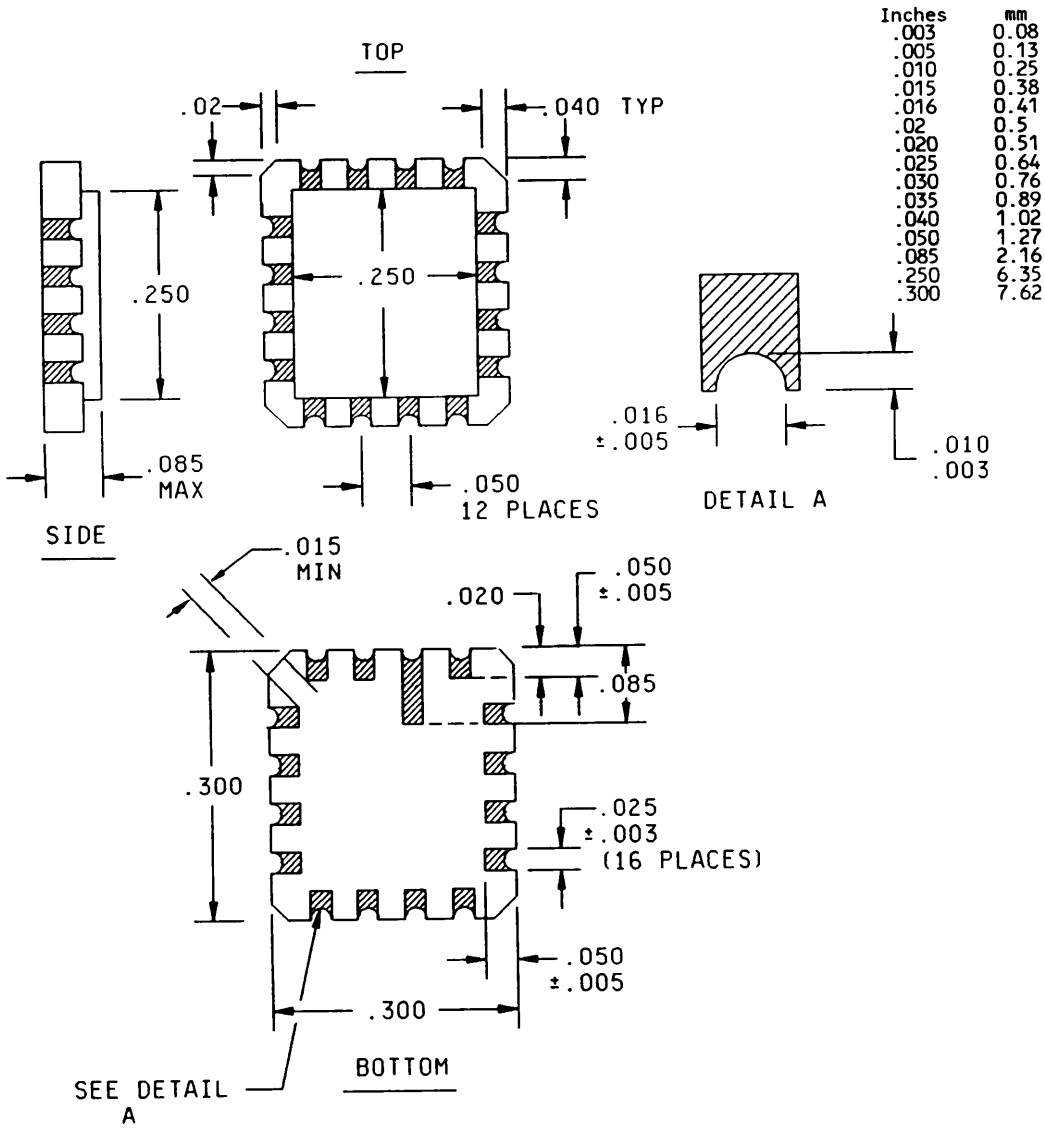


NOTES :
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.008 (0.20 mm).
4. Adjacent corner pads may be rounded or diagonal cut to meet the .015 (0.38 mm) requirement.
5. Covers termination materials A, D, and G.

FIGURE 504-5. Leadless chip carrier.

STYLE RNS030

Configuration B

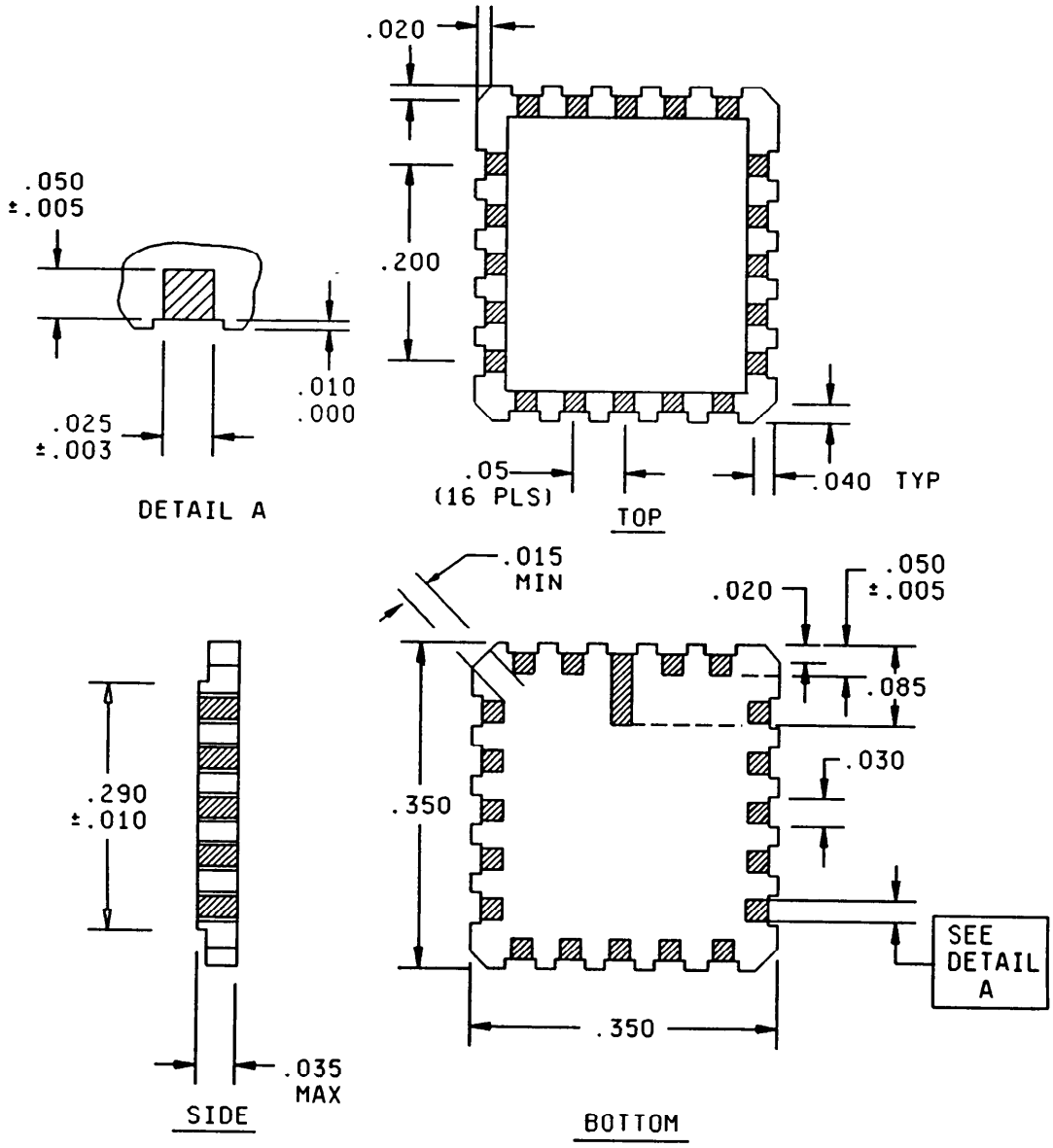


NOTES :
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.008 (0.20 mm).
4. Adjacent corner pads may be rounded or diagonal cut to meet the .015 (0.38,mm) minimum requirement.
5. Covers termination materials B, E, and H.

FIGURE 504-5. LeadLess chip carrier - Continued.

STYLE RNS040

Configuration A



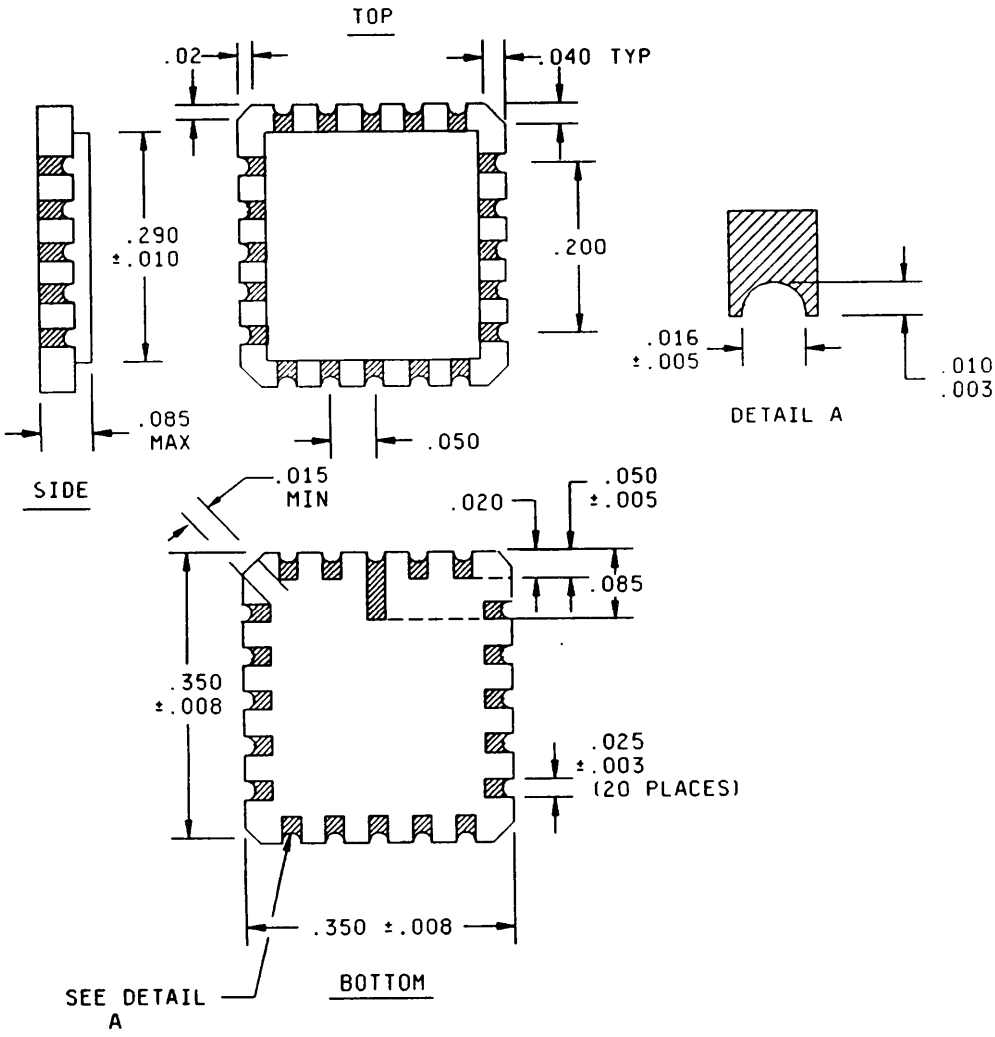
NOTES :
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.008 (0.20 mm).
4. Adjacent corner pads may be rounded or diagonal cut to meet the .015 (0.38 mm) requirement.
5. Covers termination materials A, D, and G.

FIGURE 504-5. Leadless chip carrier - Continued.

STYLE RNS040

Configuration B

Inches	mm
.003	0.08
.005	0.13
.008	0.20
.010	0.25
.015	0.38
.016	0.41
.020	0.51
.025	0.64
.030	0.76
.035	0.89
.040	1.02
.050	1.27
.085	2.16
.200	5.08
.250	6.35
.290	7.37
.300	7.62

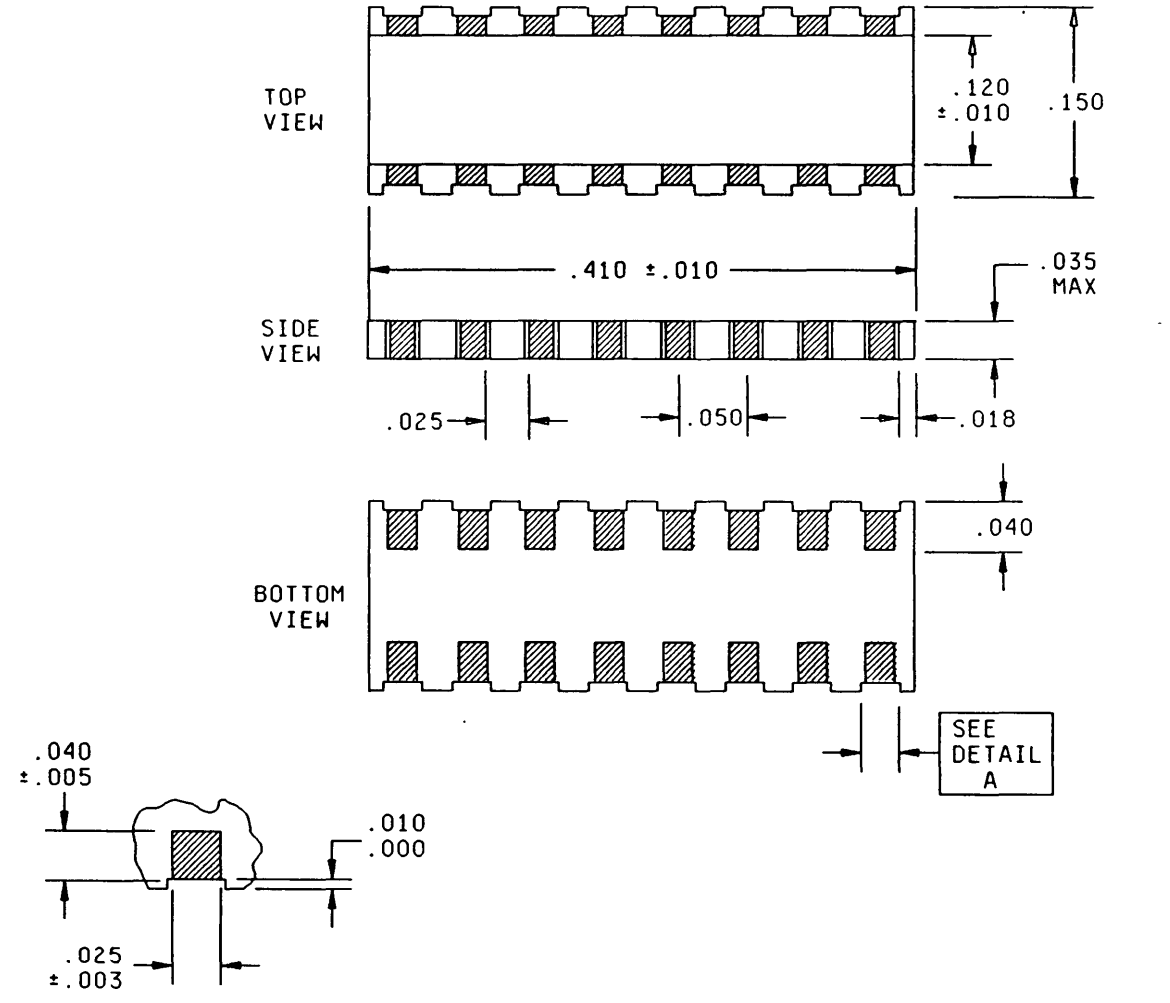


NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.008 (0.20 mm).
4. Adjacent corner pads may be rounded or diagonal cut to meet the .015 (0.38,mm) minimum requirement.
5. Covers termination materials B, E, and H.

FIGURE 504-5. Leadless chip carrier - Continued.

STYLE RNS050

Configuration A



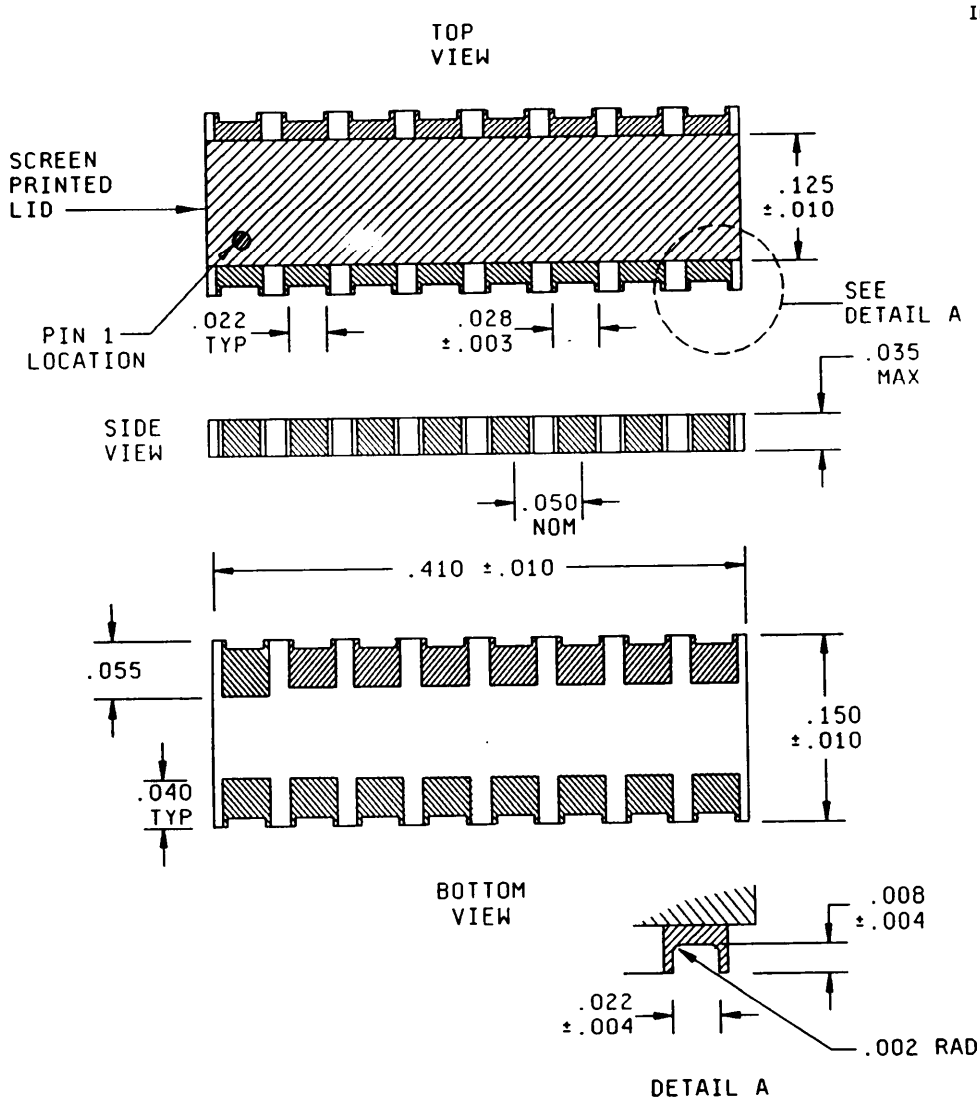
DETAIL A

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.008 (0.20 mm).
4. Pin 1 locator shall be a dot, stripe, notch, or numeral 1 adjacent to pin number 1, in the shaded area.
5. The picturization of the styles above is given as representative of the envelope of the item. Slight deviations from the outline shown, which are contained within the envelope and do not alter the functional aspect of the device are acceptable.
6. Covers termination materials A, D, and G.

FIGURE 504-5. Leadless chip carrier - Continued.

STYLE RNS050

Configuration B



Inches	mm
.002	0.05
.003	0.08
.004	0.13
.005	0.20
.008	0.25
.018	0.45
.022	0.56
.025	0.64
.028	1.02
.040	1.02
.050	1.27
.055	1.30
.120	3.05
.125	3.16
.150	3.81
.410	10.41

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerances are ±.008 (0.20 mm).
4. Pin 1 locator shall be a dot, stripe, notch, or numeral 1 adjacent to pin number 1, in the shaded area.
5. The picturization of the styles above is given as representative of the envelope of the item. Slight deviations from the outline shown, which are contained within the envelope and do not alter the functional aspect of the device are acceptable.
6. Covers termination materials B, E, and H.

FIGURE 504-5. Leadless chip carrier - Continued.

TABLE 504-II. Characteristics.

Test or condition		Symbol						Units
		K	c 2/	v 3/	H	R	M	
Resistance-temperature characteristic Tracking to the reference element		±25 ±5	±50 ±5	±50 ±5	±50 1/	±100 1/	±300 1/	PPM°C
Maximum ambient temperature at rated		70	70	70	70	70	70	°C
Maximum ambient temperature at zero power derating		125	125	125	125	125	125	Maximum percent change in resistance (0.01 ohm additional allowed for measurement error) and, when applicable, maximum percent change in resistance ratio.
Thermal shock and Power conditioning	ΔR ΔRatio	±.08 ±.03	±0. 25 ±0. 03	±0.25 ±0. 03	±0.5 1/	±0.7 1/	±0.7 1/	
Low temperature operation	ΔR ΔRatio	±.03 ±.02	±.10 ±.02	±.10 ±.02	±.10 1/	±0.25 1/	±0.5 1/	
Short-time overload	ΔR ΔRatio	±.03 ±.02	±.10 ±.02	±.10 ±.02	±0.1 1/	±0.25 1/	±0.5 1/	
Adhesion	ΔR ΔRatio	±.03 ±.02	±.10 ±.03	±.10 ±.03	±0.25 1/	±0.25 1/	±0.25 1/	
Resistance to bonding exposure	ΔR ΔRatio	±.05 ±.02	±.25 ±.02	±.25 ±.02	±0.25 1/	±0.25 1/	±0.25 1/	
Moisture resistance	ΔR ΔRatio	±.05 ±.02	±.20 ±.02	±.20 ±.02	±0.4 1/	±0.5 1/	±0.5 1/	
Shock (specified pulse)	ΔR ΔRatio	±.03 ±.02	±.25 ±.03	±.25 ±.03	±.25 1/	±.25 1/	±.25 1/	
Vibration, high frequency	ΔR ΔRatio	±.03 ±.02	±.25 ±.03	±.25 ±.03	±.25 1/	±.25 1/	±.25 1/	
Life: Qualification 25°C power rating	ΔR ΔRatio ΔR ΔRatio	±0.5 ±.03 ±0.5 ±.03	±.05 ±.03 ±0.1 ±.03	±.05 ±.03 ± 0.1 ±.03	±0.5 1/ ±6.5 1/	±.05 1/ ±0.1 1/	±2.0 1/ ±0.1 1/	
High temperature exposure	AR ARatio	±.05 ±.02	±.10 ±.02	±.10 ±.03	±0.2 1/	±0.5 1/	±l.0 1/	
Low temperature storage	ΔR ΔRatio	±.03 ±.02	±.10 ±.02	±.10 ±.02	±.10 1/	±.25 1/	±.50 1/	
Insulation resistance		10,000	10,000	10,000	10,000	10,000	10,000	Megohms
Resistance, tolerance		0.1 (B) 0.5 (D) 1.0 (F)	0.1 (B) 0.5 (D) 1.0 (F)	0.1 (B) 0.5 (D) 1.0 (F)	0.1 (B) 0.5 (D) 1.0 (F)	0.5 (D) 1.0 (F) 2.0 (G) 5.0 (J)	1.0 (F) 2.0 (G) 5.0 (J)	± percent
Resistance ratio accuracy, tolerance 4/			0.1 (B) 0.1 (D) 0.5 (F)	0.1 (B) 0.1 (D) 0.5 (F)		0.1 (B) 0.1 (D) 0.5 (F)		* percent

1/ Not available.
2/ Characteristic "C" may be furnished against H, K, M, R, and V requirements.
3/ Characteristics H, K, M, R, and V networks shall not be furnished against characteristic "C" requirements.
4/ Not applicable to characteristics K, H, and M.