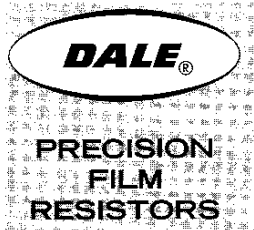


date 1973

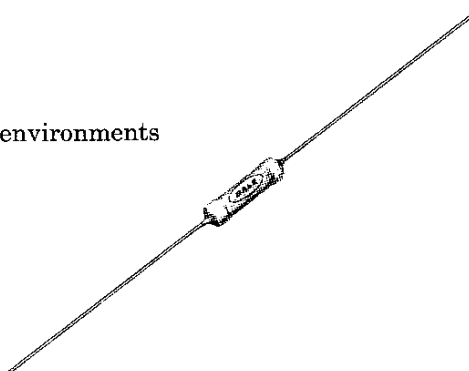
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TYPE DC COATED CARBON FILM

FEATURES

- Completely protected against severe environments
- Small size
- Low voltage coefficient
- Low noise
- Good high frequency characteristics



STANDARD ELECTRICAL SPECIFICATIONS

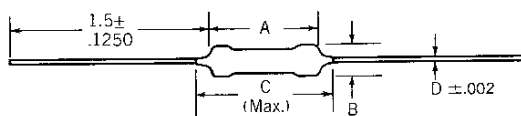
DALE TYPE	MIL. TYPE	70° POWER RATING (WATTS)	MINIMUM RESISTANCE (OHMS)	MAXIMUM 1% RESISTANCE (OHMS)	MAXIMUM 2% RESISTANCE (OHMS)	MAXIMUM WEIGHT (GRAMS)	MAXIMUM WORKING VOLTAGE
DC-1/10	—	1/10	1	400K	400K	.30	200
DC-1/8	—	1/8	1	3 Megohms	5 Megohms	.40	300
DC-1/4	RN-10 *	1/4	1	5 Megohms	6 Megohms	.65	350
DCS-1/2	RN-20 *	1/2	1	10 Megohms	15 Megohms	.95	500
DC-1	RN-25 *	1	1	15 Megohms	30 Megohms	2.7	500
DC-2	RN-30 *	2	2	100 Megohms	125 Megohms	4.7	750
DC-5	—	5	5	150 Megohms	300 Megohms	21.9	14,000

Tolerance: 2%, 1% and .5% are standard. *Obsolete. Reference only.

SPECIAL MODIFICATIONS

- Terminals may be supplied in any commercial material with several type finishes.
- Special pre-conditioning (power aging, temperature cycling, etc.) to customer specifications.
- Non-helixed units can be supplied for critical high-frequency applications above 100 megacycles.

PHYSICAL CONFIGURATIONS



DALE TYPE	DIM. A	DIM. B	DIM. C	DIM. D
DC-1/10	.250±.031	.090±.015	.395	.025 Dia.
DC-1/8	.343±.031	.109±.031	.453	.025 Dia.
DC-1/4	.468±.031	.125±.031	.578	.025 Dia.
DCS-1/2	.562±.062	.187±.031	.734	.032 Dia.
DC-1	.937±.062	.296±.031	1.187	.032 Dia.
DC-2	2.062±.062	.296±.031	2.312	.032 Dia.
DC-5	4.000±.125	.438±.031	4.300	.040 Dia.

Dale Type DC

Coated Carbon Film

date 1973

www.33audio.com

SPECIFICATIONS

APPLICABLE MIL-SPECIFICATION

MIL-R-10509D: The DC series is designed to meet or exceed the electrical and environmental requirements of Characteristic B of MIL-R-10509D, but DC models are dimensionally smaller than Characteristic B Mil. models of the same power rating. In addition, the DC series meet all the requirements including physical dimensions of Characteristic X of MIL-R-10509B.

ELECTRICAL

Tolerance: DC types are available in the following tolerances: 2%, 1%, .5%. Special tolerances and matching on request.

Voltage Coefficient: Maximum voltage coefficient is 20 PPM per volt when measured between 10% and full-rated voltage.

Dielectric Strength: 750 VAC for DC-1/10 and DC-1/8; 900 VAC for all others.

Insulation Resistance: 10,000 megohms minimum dry, 100 megohms minimum after moisture test.

MECHANICAL

Terminal Strength: 2 lb. pull test=DC-1/10 thru DC-1/4
5 lb. pull test=DCS-1/2 thru DC-5

Solderability: Continuous, satisfactory coverage when tested in accordance with MIL-R-10509F.

MATERIAL

Element: Deposited carbon film

Core: Fire-cleaned high purity ceramic

Coating: Dale-developed flame retardant epoxy, formulated for superior moisture protection.

Termination: Cap and lead termination. Standard lead material is solder coated copper.

Weldable Leads: 50 micro-inch gold-plated Dumet leads are available on a standard stocking basis, and can be specified by adding -52 to the standard model number (example: DC-1/4-52). Consult factory for charges on gold-plated Dumet, and for information on other materials such as nickel and other special alloys. Weldable leads per MIL-STD-1276.

ENVIRONMENTAL

Temperature Coefficient: The T.C. of carbon film resistors increases with resistance value. Typical T.C. is shown in the charts on this page.

General: Environmental performance is shown in the table.

Shelf Life: Resistance shift due to storage at room temperature is negligible.

ENVIRONMENTAL PERFORMANCE SPECIFICATIONS

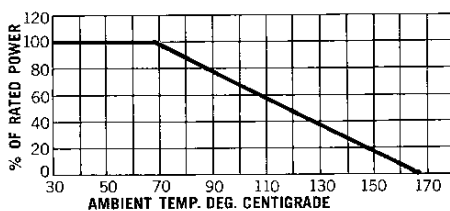
ENVIRONMENTAL TEST	DALE MAXIMUM
Temperature Coefficient	±500 PPM/°C
Temperature Cycling	0.5% ΔR
Low Temperature Operation	0.5% ΔR
Short Time Overload	0.5% ΔR
Dielectric Withstanding Voltage	0.5% ΔR
Effect of Soldering	0.5% ΔR
Moisture Resistance	1.5% ΔR
Load Life	1.0% ΔR
Shock	0.5% ΔR
Vibration	0.5% ΔR

POWER RATINGS

Dale DC power ratings are based on 1% maximum ΔR in 1000 hours load life at 70° C.

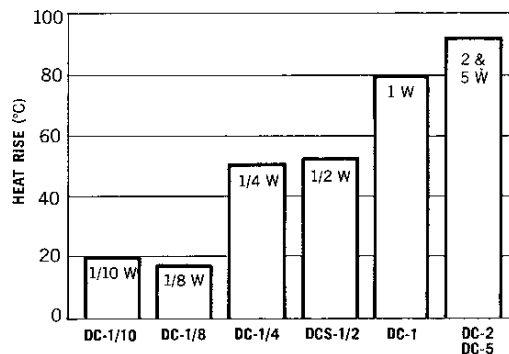
DERATING

Dale DC resistors have an operating temperature range of -55° C to +165° C. They must be derated at high ambient temperatures according to the following curve:

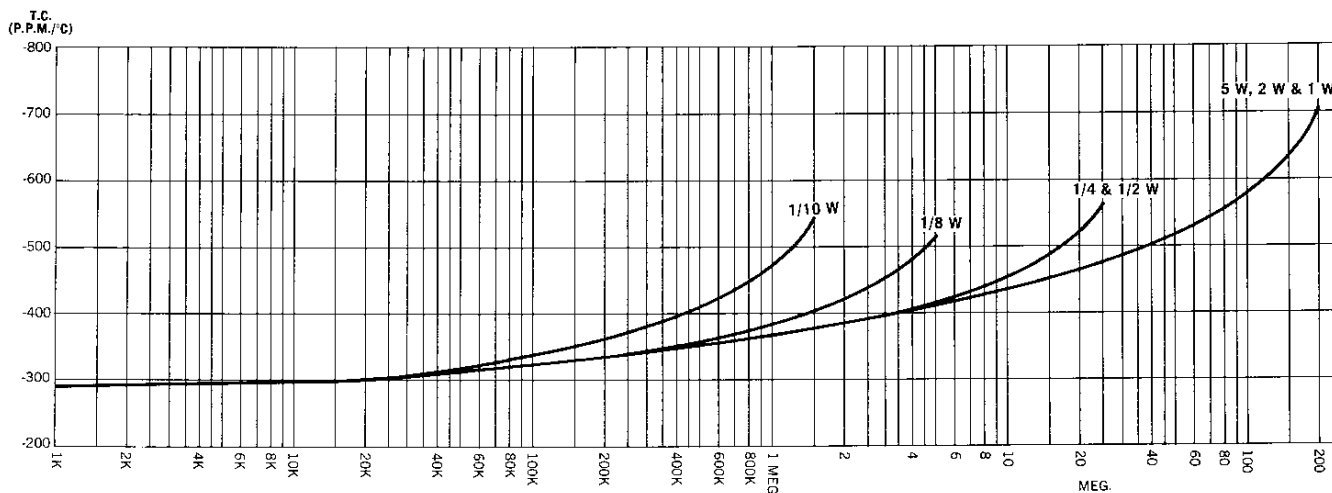


HEAT RISE

The increase in resistor surface temperature due to rated load is shown in the chart at the right. Resistor surface temperature=heat rise+ambient temperature.



TYPICAL TEMPERATURE COEFFICIENT CURVES



date 1973

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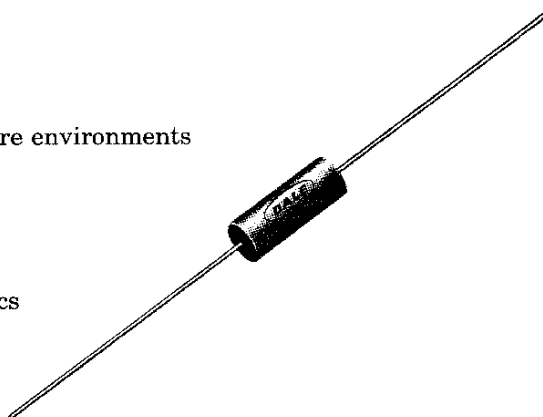


TYPE MC MOLDED CARBON FILM

Precision
Film
Resistors

FEATURES

- Completely protected against severe environments
- Low voltage coefficient
- Low noise
- High stability
- Good high frequency characteristics



STANDARD ELECTRICAL SPECIFICATIONS

DALE TYPE	MIL. * TYPE	POWER RATING (WATTS)		MINIMUM RESISTANCE (OHMS)	MAXIMUM 1% RESISTANCE (OHMS)	MAXIMUM 2% RESISTANCE (OHMS)	MAX. WT. (GRAMS)	MAX. WORKING VOLTAGE
		B	D					
MC-1/10	RN-55	1/10	1/8	1	400K	400K	.35	200
MC-1/8	RN-60	1/8	1/4	1	3 Megohms	5 Megohms	.45	300
MC-1/4	RN-65	1/4	1/2	1	5 Megohms	6 Megohms	.85	350
MCS-1/2	RN-70	1/2	3/4	1	10 Megohms	15 Megohms	1.50	500
MC-1	RN-75	1	—	1	15 Megohms	30 Megohms	4.50	500
MC-2	RN-80	2	—	2	100 Megohms	125 Megohms	8.25	750

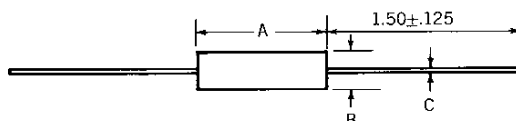
Tolerance: .5%, 1%, 2%

*Reference only. No QPL's are maintained.

SPECIAL MODIFICATIONS

- Terminals may be supplied in any commercial material with several type finishes.
- Special close tolerance matching.
- Special T.C. matches.
- Special pre-conditioning (power aging, temperature cycling, etc.) to customer specifications.

PHYSICAL CONFIGURATIONS



DALE TYPE	DIM. A	DIM. B	DIM. C
MC-1/10	.260±.010	.095±.005	.025 Dia.
MC-1/8	.406±.015	.135±.010	.025 Dia.
MC-1/4	.593±.015	.203±.015	.025 Dia.
MCS-1/2	.730±.020	.250±.015	.032 Dia.
MC-1	1.093±.020	.375±.015	.032 Dia.
MC-2	2.188±.020	.375±.015	.032 Dia.

Dale Type MC Molded Carbon Film

date 1973

www.33audio.com

SPECIFICATIONS

APPLICABLE MIL-SPECIFICATION

MIL-R-10509F: The MC series meets or exceeds the electrical, environmental and dimensional requirements of characteristic D of MIL-R-10509F, and characteristics B and D of MIL-R-10509D.

ELECTRICAL

Tolerance: MC types are available in the following standard tolerances: 2%, 1%, .5%. Special tolerances and matching on request.

Voltage Coefficient: Maximum voltage coefficient is 20 PPM per volt when measured between 10% and full-rated voltage.

Dielectric Strength: 750 VAC for MC-1/10 and MC-1/8; 900 VAC for all others.

Insulation Resistance: 10,000 megohms minimum dry, 100 megohms minimum after moisture test. 200,000 megohms typical after moisture test.

ENVIRONMENTAL

Temperature Coefficient: The T.C. of carbon film resistors increases with resistance value. Typical T.C. is shown in the charts on this page.

General: Environmental performance is shown in the table. Test methods are those specified in MIL-R-10509F.

Shelf Life: Resistance shifts due to storage at room temperature are negligible.

MECHANICAL

Terminal Strength: 2 lb. pull test=MC-1/10 thru MC-1/4
5 lb. pull test=MCS-1/2 thru MC-2

Solderability: Continuous, satisfactory coverage when tested in accordance with MIL-R-10509F.

MATERIAL

Element: Deposited carbon film

Core: Fire-cleaned high purity ceramic

Encapsulant: Specially Dale-formulated epoxies—molded construction

Termination: Cap and lead termination. Standard lead material is solder coated copper.

Weldable Leads: 50 micro-inch gold-plated Dumet leads are available on a standard stocking basis, and can be specified by adding -52 to the standard model number (example: MC-1/4-52). Consult factory for charges on gold-plated Dumet, and for information on other materials such as nickel and other special alloys. Weldable leads per MIL-STD-1276.

ENVIRONMENTAL PERFORMANCE SPECIFICATIONS

REQUIREMENT		CHAR. B	CHAR. D		
Dale model which meets or exceeds Mil. specifications	RN-55 RN-60 RN-65 RN-70 RN-75 RN-80	MC-1/10 MC-1/8 MC-1/4 MCS-1/2 MC-1 MC-2	MC-1/10 MC-1/8 MC-1/4 MCS-1/2		
Power Rating Temp.		70° C	70° C		
Temperature Coefficient		±500 PPM/°C	+200 -500 PPM/°C		
ENVIRONMENTAL TESTS		MIL. MAX.	DALE TYP.	MIL. MAX.	DALE TYP.
Temperature Cycling		0.5%ΔR	0.25%ΔR	0.5%ΔR	0.25%ΔR
Low Temp. Operation		0.5%ΔR	0.05%ΔR	0.5%ΔR	0.05%ΔR
Short Time Overload		0.5%ΔR	0.05%ΔR	0.5%ΔR	0.05%ΔR
Dielectric Withstanding Voltage		0.5%ΔR	0.01%ΔR	0.5%ΔR	0.01%ΔR
Effect of Soldering		0.5%ΔR	0.01%ΔR	0.5%ΔR	0.01%ΔR
Moisture Resistance		1.5%ΔR	0.25%ΔR	1.5%ΔR	0.25%ΔR
Load Life		1.0%ΔR	0.10%ΔR	1.0%ΔR	0.20%ΔR
Shock		0.5%ΔR	0.10%ΔR	0.5%ΔR	0.10%ΔR
Vibration		0.5%ΔR	0.10%ΔR	0.5%ΔR	0.10%ΔR

POWER RATINGS

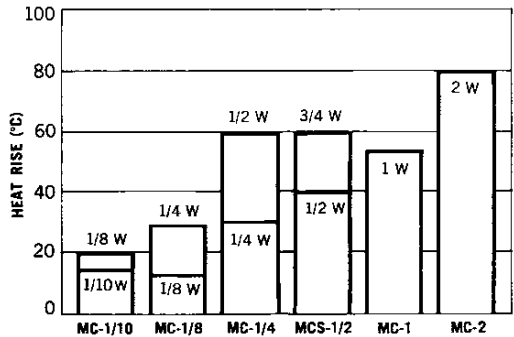
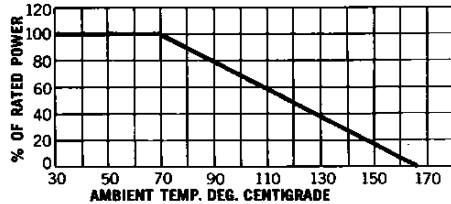
Dale MC resistors may be operated with completely satisfactory performance at either the higher characteristic D ratings or the more conservative characteristic B ratings. Both are based on 1% maximum ΔR per 1000 hours load life at 70° C.

HEAT RISE

The increase in resistor surface temperature due to rated load is shown in the chart at the right. Resistor surface temperature= heat rise+ambient temperature.

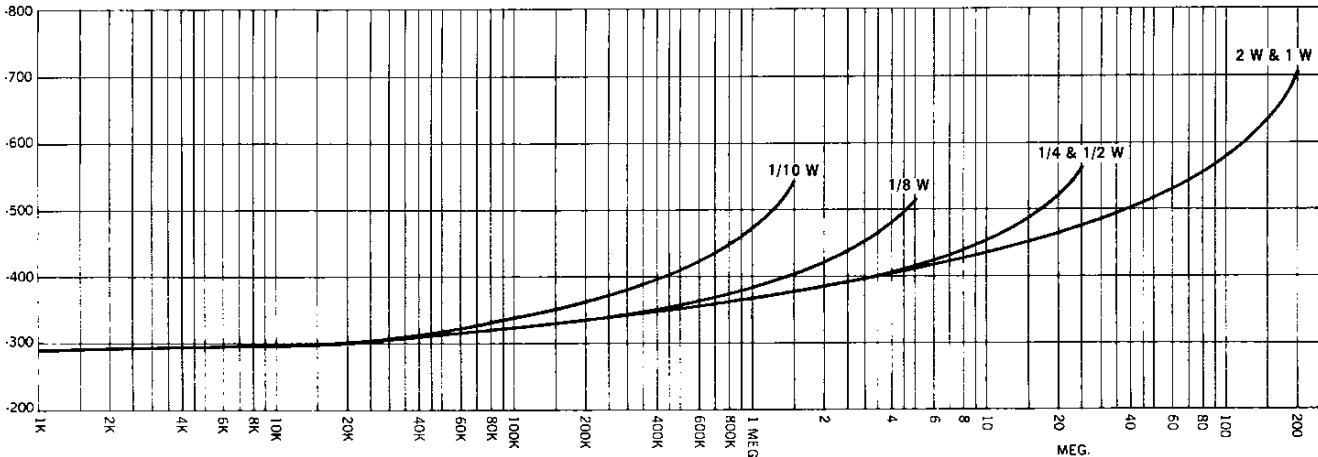
DERATING

Dale MC resistors have an operating temperature range of -55° C to +165° C. They must be derated at high ambient temperatures according to the following curve:



TYPICAL TEMPERATURE COEFFICIENT CURVES

T.C.
(P.P.M./°C)



date 1973 Hermetically Sealed Film

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SPECIAL PURPOSE FILM RESISTORS

This section lists a few of the special purpose film resistors readily available from Dale. In addition, some of the many construction and processing options are also shown. To expedite your request for a special resistor, Dale maintains a Special Product Section within its Film Division.

Fulltime engineers assigned to this section draw on the industry's largest file of non-standard resistor design and product information. They can often, in a matter of minutes, determine a fast, practical route to the production of your non-standard part. For special types not shown here, see page 100 for packaged networks or Dale's Functional Guide to Non-Standard Resistors.

FILM OPTIONS

PACKAGING: Silicone coating, epoxy coating, epoxy molding (single or multi-element), heat-sink chassis mount, hermetic seal (ceramic seal or can-encapsulated), clip mount, bare end cap and leads, modules.

LEADS: Radial and axial ribbon type, special dimensions, materials and formations.

SPECIAL TYPES: Extended high or low resistance ranges, low reactance, very low or high T.C., low noise.

PRE-CONDITIONING: Power aging, temperature cycling, temperature and power, short-time overload, thermal shock, X-ray, noise test, temperature aging.

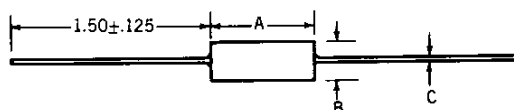
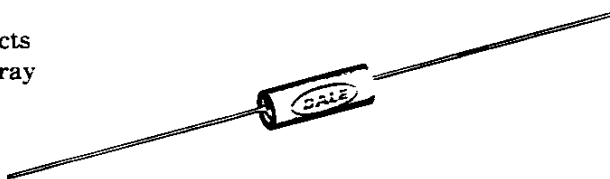
MATCHING: T.C. by pairs, value and sets, close tolerance, resistance ratio.

HERMETICALLY SEALED FILM RESISTORS

TYPE MFH (Metal Film) **TYPE DCH** (Carbon Film)

FEATURES

- Non-hygroscopic ceramic envelope protects completely against moisture and salt spray
- Low noise
- Low voltage coefficient
- Good high frequency characteristics
- Other styles and wattages available on request.



STANDARD ELECTRICAL SPECIFICATIONS

ELEMENT	DALE TYPE	MIL. TYPE	POWER RATING* (WATTS)	STANDARD 1% RESISTANCE RANGE (OHMS)	MAX. WEIGHT (GRAMS)	MAX. WORKING VOLTAGE	DIMENSIONS		
							A LENGTH	B DIAMETER	C LEAD DIAMETER
METAL FILM	MFH-1/10	RN-55	1/10	30.1 to 301K	.3	200	.250±.031	.110±.010	.025
	MFH-1/8	-	1/8	10 to 1 Megohm	.6	300	.281±.031	.155±.010	.025
	MFH-1/4	RN-60	1/4	10 to 1 Megohm	.7	350	.437±.031	.155±.010	.025
	MFH-1/2	-	1/2	10 to 1.5 Megohms	1.8	500	.640±.031	.243±.010	.032
	MFH-1	RN-75	1	25 to 2.6 Megohms	7.9	500	1.093±.031	.400±.015	.032
CARBON FILM	MFH-2	RN-80	2	100 to 10 Megohms	11.1	750	2.250±.031	.400±.015	.032
	DCH-1/10	RN-55	1/10	2 to 400K	.3	200	.250±.031	.110±.010	.016
	DCH-1/8	-	1/8	1 to 3 Megohms	.6	300	.281±.031	.155±.010	.025
	DCH-1/4	RN-60	1/4	1 to 5 Megohms	.7	350	.437±.031	.155±.010	.025
	DCSH-1/2	-	1/2	1 to 10 Megohms	1.8	500	.640±.031	.243±.010	.032
DCH-1	RN-75	1	1 to 15 Megohms	7.9	500	1.093±.031	.400±.015	.032	

*Rating at 125° C for MFH Types; at 70° C for DCH Types.

Tolerance: MFH - 1%, .5%, .25%, .10%
DCH - 2%, 1%, .5%

Operating Temperature Range: -55° to + 175° C

Applicable Mil. Spec.: MFH types meet requirements of Char. C, D, E, G of MIL-R-10509E
DCH types meet requirements of Char. D, G of MIL-R-10509E and Char. B, D and G of MIL-R-10509D.