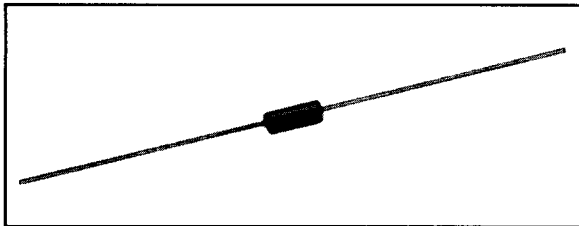


# MODELS FP55E, 60E, 55C, 60C, 55D Metal Film Resistors

Precision, Flameproof



## FEATURES

- Flameproof coating
- Ideal for circuits where high power overloads may be encountered
- Tolerances down to .1%
- Temperature Coefficient:  $\pm 25\text{PPM}/^\circ\text{C}$ ,  $\pm 50\text{PPM}/^\circ\text{C}$
- Leads are electroplated, high purity copper
- Meets IEC-695-2-2 requirements for flammability
- 96% alumina substrate has superior thermal properties which reduce hot spot temperatures and long-term aging effects

## STANDARD ELECTRICAL SPECIFICATIONS

MODEL	WATTAGE RATING 70°C	VOLTAGE RATING	RESISTANCE RANGE (Ohms)	STANDARD TOLERANCE	TEMPERATURE COEFFICIENT PPM/°C
FP55E	1/4	200	49.9-499k	.1, .25, .5, 1%	25
FP60E	1/2	250	49.9-1M	.1, .25, .5, 1%	25
FP55C	1/4	200	49.9-499k	.1, .25, .5, 1%	50
FP60C	1/2	250	49.9-1M	.1, .25, .5, 1%	50
FP55D	1/4	250	10-499k	1, 2, 5%	100

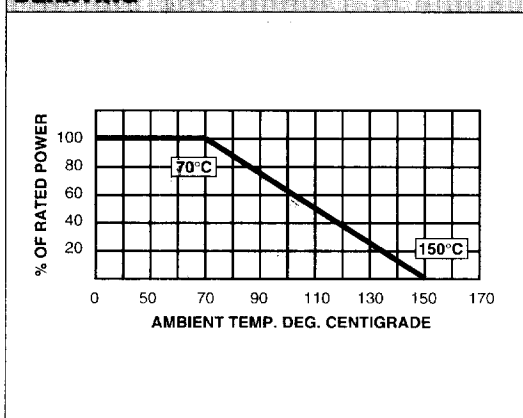
## DIMENSIONAL CONFIGURATIONS [Numbers in brackets indicate millimeters]

MODEL	A	B	D
FP55E	.235 $\pm$ .020 [5.97 $\pm$ .508]	.100 [2.54] Max.	.025 [.635]
FP60E	.350 $\pm$ .030 [8.89 $\pm$ .762]	.130 $\pm$ .015 [3.30 $\pm$ .381] -.025 -.635]	.025 [.635]
FP55C	.235 $\pm$ .020 [5.97 $\pm$ .508]	.100 [2.54] Max.	.025 [.635]
FP60C	.350 $\pm$ .030 [8.89 $\pm$ .762]	.130 $\pm$ .015 [3.30 $\pm$ .381] -.025 -.635]	.025 [.635]
FP55D	.235 $\pm$ .020 [5.97 $\pm$ .508] -.025 -.635]	.090 $\pm$ .008 [2.29 $\pm$ .203]	.025 [.635]

## ENVIRONMENTAL PERFORMANCE

MODEL	THERMAL SHOCK $\Delta R$ MAX. $\pm$ %	SHORT TIME OVERLOAD $\Delta R$ MAX. $\pm$ %	LOW TEMP. OPERATION $\Delta R$ MAX. $\pm$ %	MOISTURE RESISTANCE $\Delta R$ MAX. $\pm$ %	SHOCK $\Delta R$ MAX. $\pm$ %	VIBRATION $\Delta R$ MAX. $\pm$ %	LOAD LIFE 1000 HOURS MIL RATING $\Delta R$ MAX. $\pm$ %	TERMINAL STRENGTH $\Delta R$ MAX. $\pm$ %	D. W. V. $\Delta R$ MAX. $\pm$ %	EFFECT SOLDER HEAT $\Delta R$ MAX. $\pm$ %
FP55E	0.25	0.25	0.25	1.0	0.1	0.1	0.5	0.1	0.1	0.1
FP60E	0.25	0.25	0.25	1.0	0.1	0.1	0.5	0.1	0.1	0.1
FP55C	0.25	0.25	0.25	1.0	0.1	0.1	0.5	0.1	0.1	0.1
FP60C	0.25	0.25	0.25	1.0	0.1	0.1	0.5	0.1	0.1	0.1
FP55D	0.50	0.50	0.50	1.0	0.5	0.5	1.0	0.25	0.5	0.25

## DERATING



## PART MARKING

- Company name
- Value
- Tolerance
- Model, Case Size and Temperature Coefficient

## HOW TO ORDER

FP MODEL	55 SIZE	E TEMPERATURE COEFFICIENT	51k1 VALUE	$\pm 1\%$ TOLERANCE
	55 60	E = $\pm 25\text{PPM}/^\circ\text{C}$ C = $\pm 50\text{PPM}/^\circ\text{C}$ D = $\pm 100\text{PPM}/^\circ\text{C}$	R = Ohm k = Thousand ohm M = Million ohm (51k1 = 51,000 ohm, 51R1 = 51.1 ohm.)	$\pm .1\%$ $\pm 2\%$ $\pm .25\%$ $\pm 5\%$ $\pm .5\%$ $\pm 10\%$ $\pm 1\%$

# CHECKLIST FOR ORDERING FILM RESISTORS



## ORDERS MUST HAVE COMPLETE INFORMATION INCLUDING THE FOLLOWING:

1. Resistor type and model number
2. Resistor wattage rating
3. Resistor value
4. Resistor tolerance
5. Temperature Coefficient
6. Special quantity of each item
7. Specify routing
8. Desired delivery
9. If you have a drawing covering the part, specify your part number and drawing number and supply a copy with the order. Including the Dale® specification number on your drawings will assure you of exact duplication on all future orders.
10. Priority rating under DMS regulations and contract number (if applicable).
11. Specify if Letter of Certification is required.
12. Prices on specific items and quantities will be quoted on request. Quantity of each item ordered at one time determines unit price for manufacturers' orders.

### STANDARD DECADE RESISTANCE VALUES

The following table lists four established number series which are used as preferred values in electronic design. Each series is shown under an associated value of tolerance %. The number series under the 10% column is known as the E12 Series because there are 12 standard values within a decade range. 2% and 5% utilize the E24 Series, 1% uses E96 and .1%, .25% and .5% use E192. Successive values within a decade series are related (approximately) by a factor of  $^{12}\sqrt{10}$  for the E12 Series,  $^{24}\sqrt{10}$  for the E24 Series,  $^{96}\sqrt{10}$  for the E96 Series and  $^{192}\sqrt{10}$  for the E192 Series.

Use of standard values is encouraged because stocking programs are designed around them. However, intermediate values can be special ordered where permitted. Consult factory.

.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		2%, 5%		10%	
10.0	10.0	13.3	13.3	17.8	17.8	23.7	23.7	31.6	31.6	42.2	42.2	56.2	56.2	75.0	75.0	10	10
10.1		13.5		18.0		24.0		32.0		42.7		56.9		75.9		11	—
10.2	10.2	13.7	13.7	18.2	18.2	24.3	24.3	32.4	32.4	43.2	43.2	57.6	57.6	76.8	76.8	12	12
10.4		13.8		18.4		24.6		32.8		43.7		58.3		77.7		13	—
10.5	10.5	14.0	14.0	18.7	18.7	24.9	24.9	33.2	33.2	44.2	44.2	59.0	59.0	78.7	78.7	15	15
10.6		14.2		18.9		25.2		33.6		44.8		59.7		79.6		16	—
10.7	10.7	14.3	14.3	19.1	19.1	25.5	25.5	34.0	34.0	45.3	45.3	60.4	60.4	80.6	80.6	18	18
10.9		14.5		19.3		25.8		34.4		45.9		61.2		81.6		20	—
11.0	11.0	14.7	14.7	19.6	19.6	26.1	26.1	34.8	34.8	46.4	46.4	61.9	61.9	82.5	82.5	22	22
11.1		14.9		19.8		26.4		35.2		47.0		62.6		83.5		24	—
11.3	11.3	15.0	15.0	20.0	20.0	26.7	26.7	35.7	35.7	47.5	47.5	63.4	63.4	84.5	84.5	27	27
11.4		15.2		20.3		27.1		36.1		48.1		64.2		85.6		30	—
11.5	11.5	15.4	15.4	20.5	20.5	27.4	27.4	36.5	36.5	48.7	48.7	64.9	64.9	86.6	86.6	33	33
11.7		15.6		20.8		27.7		37.0		49.3		65.7		87.6		36	—
11.8	11.8	15.8	15.8	21.0	21.0	28.0	28.0	37.4	37.4	49.9	49.9	66.5	66.5	88.7	88.7	39	39
12.0		16.0		21.3		28.4		37.9		50.5		67.3		89.8		43	—
12.1	12.1	16.2	16.2	21.5	21.5	28.7	28.7	38.3	38.3	51.1	51.1	68.1	68.1	90.9	90.9	47	47
12.3		16.4		21.8		29.1		38.8		51.7		69.0		92.0		51	—
12.4	12.4	16.5	16.5	22.1	22.1	29.4	29.4	39.2	39.2	52.3	52.3	69.8	69.8	93.1	93.1	56	56
12.6		16.7		22.3		29.8		39.7		53.0		70.6		94.2		62	—
12.7	12.7	16.9	16.9	22.6	22.6	30.1	30.1	40.2	40.2	53.6	53.6	71.5	71.5	95.3	95.3	68	68
12.9		17.2		22.9		30.5		40.7		54.2		72.3		96.5		75	—
13.0	13.0	17.4	17.4	23.2	23.2	30.9	30.9	41.2	41.2	54.9	54.9	73.2	73.2	97.6	97.6	82	82
13.2		17.6		23.4		31.2		41.7		55.6		74.1		98.8		91	—

Standard resistance values are obtained from the decade table by multiplying by powers of 10. As an example, 13.3 can represent ohms, 133 ohms, 1.33k, 13.3k, 133k, 1.33 Megohm.



# Military Product Identification

## MILITARY PART ORDERING EXAMPLES

To help in ordering, the following are representative samples of military part numbers cross-referenced to Dale® part numbers. For complete information, consult Military Specification Qualified Products List.

### RESISTORS: Fixed and Variable

<b>MIL-R-26E</b> (Basic [RW]) (Established Reliability MIL-R-39007 [RWR]) RW80 $\frac{U}{1}$ $\frac{49R9}{2}$ $\frac{F}{3}$ $\frac{4}{4}$ = Dale Type G-3 $\frac{49.9}{3}$ ohm $\frac{1}{4}$ % RW69 $\frac{V}{1}$ $\frac{101}{2}$ $\frac{3}{3}$ = Dale Type CW-2C-1 $\frac{100}{3}$ ohm, 5%	1. Style 2. Characteristic 3. Resistance Value 4. Tolerance	1. Style 2. Characteristic 3. Value (Tolerance below 1 ohm 10%, 1 ohm and up 5%)
<b>MIL-R-10509F</b> (Basic [RN]) (Established Reliability MIL-R-55182 [RNR]) RN60 $\frac{D}{1}$ $\frac{1003}{2}$ $\frac{F}{3}$ $\frac{4}{4}$ = Dale Type CMF-60 $\frac{T-1}{2}$ $\frac{100k}{3}$ $\frac{1}{4}$ %	1. Style 2. Characteristic - Temperature Coefficient 3. Resistance Value 4. Tolerance	
<b>MIL-R-18546D</b> (Basic [RE]) (Established Reliability MIL-R-39009 [RER]) RE65 $\frac{G}{1}$ $\frac{1001}{2}$ $\frac{3}{3}$ = Dale Type RH-10 $\frac{1k}{3}$	NOTE: 1% tolerance per Military Specification.	1. Style 2. Characteristic - Maximum continuous operating temperatures 3. Resistance Value
<b>MIL-R-22684C</b> (Basic [RL]) (Established Reliability MIL-R-39017 [RLR]) RL07 $\frac{S}{1}$ $\frac{103}{2}$ $\frac{J}{3}$ $\frac{4}{4}$ = Dale Type CMF-07 $\frac{10k}{3}$ $\frac{5\%}{4}$	NOTE: Parts will be color banded.	1. Style 2. Terminal 3. Resistance Value 4. Tolerance
<b>MIL-R-22097F</b> (Basic [RJ]) (Established Reliability MIL-R-39035 [RJR]) RJ24 $\frac{F}{1}$ $\frac{P}{2}$ $\frac{103}{3}$ $\frac{4}{4}$ = Techno Type 412 $\frac{1k}{1,3}$ $\frac{10\%}{4}$	NOTE: 10% tolerance per Military Specification.	1. Style 2. Characteristic 3. Terminal 4. Resistance
<b>MIL-R-27208C</b> (Basic [RT]) (Established Reliability MIL-R-39015 [RTR]) RT24 $\frac{C}{1}$ $\frac{2}{2}$ $\frac{P}{3}$ $\frac{102}{4}$ $\frac{5}{5}$ = Techno Type 126S $\frac{1k}{1,4}$ $\frac{5\%}{5}$	NOTE: 5% tolerance per Military Specification.	1. Style 2. Resistance - Temperature Characteristic 3. Temperature Characteristic 4. Terminal 5. Resistance
<b>MIL-R-39007G</b> (Established Reliability [RWR]) (Basic - MIL-R-26 [RW]) RWR74 $\frac{S}{1}$ $\frac{10R1}{2}$ $\frac{F}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Dale Type ESS-5 $\frac{10.1}{3}$ ohm $\frac{1}{4}$ % $\frac{R}{5}$		1. Style 2. Terminal 3. Resistance Value 4. Tolerance 5. Failure Rate Level
<b>MIL-R-39009C</b> (Established Reliability [RER]) (Basic - MIL-R-18546 [RE]) RER65 $\frac{F}{1}$ $\frac{1001}{2}$ $\frac{R}{3}$ $\frac{4}{4}$ = Dale Type ERH-10 $\frac{1\%}{1}$ $\frac{1k}{2}$ $\frac{R}{3}$ $\frac{4}{4}$		1. Style 2. Tolerance 3. Resistance Value 4. Failure Rate Level
<b>MIL-R-39015C</b> (Established Reliability [RTR]) (Basic - MIL-R-27208 [RT]) RTR24 $\frac{D}{1}$ $\frac{P}{2}$ $\frac{102}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Techno Type M39015/3 $\frac{007}{1,2}$ $\frac{P}{4}$ $\frac{R}{3}$ $\frac{5}{5}$ NOTE: 5% tolerance per Military Specification.		1. Style 2. Characteristic 3. Terminal 4. Resistance 5. Failure Rate Level
<b>MIL-R-39017E</b> (Established Reliability [RLR]) (Basic - MIL-R-22684 [RL]) RLR07 $\frac{C}{1}$ $\frac{1002}{2}$ $\frac{G}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Dale Type ERL-07 $\frac{10k}{1}$ $\frac{2\%}{3}$ $\frac{R}{4}$ $\frac{5}{5}$		1. Style 2. Terminal Type 3. Resistance Value 4. Tolerance 5. Failure Rate Level
<b>MIL-R-39035B</b> (Established Reliability [RJR]) (Basic - MIL-R-22097 [RJ]) RJR24 $\frac{F}{1}$ $\frac{P}{2}$ $\frac{102}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Techno Type RJR24 $\frac{F}{1}$ $\frac{P}{2}$ $\frac{1k}{3}$ $\frac{10\%}{4}$ NOTE: 10% tolerance per Military Specification.		1. Style 2. Characteristic 3. Terminal 4. Resistance 5. Failure Rate Level
<b>MIL-R-49465A</b> (Basic [RLV]) (Established Reliability - None) M49465 $\frac{02}{1}$ $\frac{L}{2}$ $\frac{R0100}{3}$ $\frac{J}{4}$ $\frac{5}{5}$ = Dale Type CPSL-3-6 $\frac{0.01}{4}$ ohm $\frac{5\%}{5}$	NOTE: L Characteristic.	1. Military Specification 2. Specification Sheet Number 3. Characteristic 4. Resistance Value 5. Tolerance
<b>MIL-R-55182F</b> (Established Reliability [RNR]) (Basic MIL-R-10509 [RN]) RNC55 $\frac{H}{1}$ $\frac{49R9}{2}$ $\frac{F}{3}$ $\frac{S}{4}$ $\frac{5}{5}$ = Dale Type ERC-55 $\frac{T-2}{1}$ $\frac{49.9}{2}$ ohm $\frac{1}{3}$ % $\frac{S}{4}$ $\frac{5}{5}$		1. Style 2. Characteristic/Temperature Coefficient 3. Resistance Value 4. Tolerance 5. Failure Rate Level
<b>MIL-R-55342E</b> (Established Reliability [RM]) (Basic - None) M55342 $\frac{M}{1}$ $\frac{02}{2}$ $\frac{S}{3}$ $\frac{100E}{4}$ $\frac{R}{5}$ $\frac{6}{6}$ = Dale Type RCM550 $\frac{100k}{3,4}$ $\frac{1\%}{5}$ $\frac{R}{6}$ NOTES: M Characteristic. One surface, pretinned, solderable terminations. D55342 is used for 07 detail specification sheet. Separate code for resistance value and tolerance is used in this Military Specification.		1. Military Specification 2. Characteristic 3. Specification Sheet Number 4. Termination Material 5. Resistance Value and Tolerance 6. Failure Rate Level

## Military Product Identification

MILITARY PART ORDERING EXAMPLES			
<b>RACK AND PANEL CONNECTORS</b>			
<b>MIL-C-28748A</b> (Basic) (Established Reliability - None)		1. Military Specification 2. Specification Sheet Number 3. Insert Designator (B-7 Contacts) 4. Shield (0 = None)	
<b>M28748</b> 1	<b>7</b> 2	<b>B</b> 3	<b>0 0 F 1A</b> 4 5 6 7 = Dale Type
MMP22G5		<b>7</b> 3	<b>SL2L</b> 6
5. Shell Polarization (0 = None) 6. Jackscrews or Guidepins 7. Contacts (1A = 100 percent size 22)			
<b>RESISTOR NETWORKS</b>			
<b>MIL-R-83401F</b> (Basic [RZ]) (Established Reliability MIL-R-874 [RZR])		1. Military Specification 2. Specification Sheet Number 3. Characteristic 4. Resistance Value	
<b>M8340101</b> 1, 2	<b>M</b> 3	<b>1003</b> 4	<b>G A</b> 5 6 = Dale Type
MDM 100k		<b>2%</b> 5	<b>A</b> 6
NOTE: M Characteristic.		5. Tolerance 6. Schematic	
<b>Resistance Value Examples</b>			
<b>Three Digit Figure</b>		<b>Four Digit Figure</b>	
100 = 10 ohm, 101 = 100 ohm 102 = 1k ohm, 203 = 20k ohm		49R9 = 49.9 ohm, 1000 = 100 ohm 1001 = 1k ohm, 1004 = 1 Megohm	
<b>Five Digit Figure</b>			
10R60 = 10.6 ohm, 10000 = 1k ohm 12701 = 12.7k ohm, 10202 = 102k ohm			
<b>Tolerance Examples</b>			
A = ± 0.05%		B = ± 0.10%	
D = ± 0.50%		F = ± 1.0%	
G = ± 2.0%		J = ± 5.0%	
<b>TRANSFORMERS AND INDUCTORS</b>			
<b>MIL-T-27E</b> (Basic [TF]) (Established Reliability - None)		1. Military Specification 2. Specification Sheet Number 3. Specification Sheet Dash Number Indicating Value and Electrical Ratings	
<b>M27</b> 1	<b>215</b> 2	<b>05</b> 3	= Dale Type
TE-3Q0TR		1.0 mH 2%	
<b>MIL-C-15305E</b> (Basic [LT]) (Established Reliability MIL-C-39010)		NOTES: Parts will be color banded. Value per Military Standard dash number.	
<b>LT</b> 1	<b>4</b> 2	<b>K</b> 3	= Dale Type
IM-2 (.10 μH to 1.00 μH)		10%	
1. Style 2. Grade and Class 3. Family K = Coil, Radio Frequency, Fixed			

MILITARY COLOR CODES - FILM RESISTORS			
<b>BAND A &amp; B</b>		<b>BAND C</b>	
<b>COLOR</b>	<b>1st and 2nd SIGNIFICANT FIGURE</b>	<b>COLOR</b>	<b>VALUE MULTIPLIER</b>
Black	0	Black	1
Brown	1	Brown	10
Red	2	Red	100
Orange	3	Orange	1,000
Yellow	4	Yellow	10,000
Green	5	Green	100,000
Blue	6	Blue	1,000,000
Purple (Violet)	7	Silver	0.01
Gray	8	Gold	0.1
White	9		
<b>BAND D</b>		<b>BAND E</b>	
<b>COLOR</b>	<b>RESISTANCE TOLERANCE (Percent)</b>	<b>COLOR</b>	<b>TERMINAL</b>
Gold	± 5%	White	Solderable
Red	± 2%		

### 8 1/2 x 11 & Pocket-Size Color Code ID Charts

For a 8 1/2 x 11 chart, or a supply of pocket-size charts showing actual colors used in marking film resistors and RF chokes, write to Dale Electronics, Inc., Advertising Department, 2064 12th Avenue, P.O. Box 609, Columbus, NE 68602-0609 or call (402) 563-6417.

Indicate size and type of chart desired: Film Resistor chart or RF Choke.

MILITARY COLOR CODES - RF COILS			
	<b>BAND A &amp; B</b>	<b>BAND C</b>	<b>BAND C</b>
<b>COLOR</b>	<b>SIGNIFICANT FIGURES or DECIMAL POINT</b>	<b>MULTIPLIER* or SIGNIFICANT FIGURE</b>	<b>INDUCTANCE TOLERANCE</b>
Black	0	1	—
Brown	1	10	± 1%
Red	2	100	± 2%
Orange	3	1,000	± 3%
Yellow	4	10,000	± 4%
Green	5	—	—
Blue	6	—	—
Violet	7	—	—
Gray	8	—	—
White	9	—	—
None**	—	—	± 20%
Silver	—	—	± 10%
Gold	Decimal Point	—	± 5%
<p><b>Band "A"</b> is twice the width of the other bands and is silver in color to identify part as an inductor. ***</p> <p><b>For Inductance Values Less Than 10</b> either Band "B" or Band "C" will be gold and will represent the decimal point. The other two bands ("B" and "D" or "C" and "D") will represent significant figures.</p> <p><b>For Inductance Values of 10 or More</b> Band "B" and Band "C" represent significant figures and Band "D" is the Multiplier.</p> <p><b>For small units</b>, dots may be used in place of bands.</p>			

\* The multiplier is the factor by which two significant figures are multiplied to yield the nominal inductance value.

\*\* Indicates body color.

\*\*\* Coated inductors are marked with four color bands, the first being a double wide significant figure or decimal point in lieu of the double wide silver inductor identifier.