

## FEATURES

Electro-Films Inc. offers a broad line of precision thin-film DIP (Dual In-Line Package) resistor networks for military or commercial applications. Electro-Films, Inc.'s unique fabrication process provides for the production of a wide range of resistor network configurations, without costly artwork charges, while achieving a fast turnaround time.

- Available in molded, hermetic, and coated package configurations.
- Excellent resistor matching, temperature tracking, and long-term stability.
- Low cost and fast production for custom networks.
- Any combination of values from  $10\Omega$  to  $1M\Omega$ .
- Hermetically sealed packages available with 8, 14, 16, 18, and 24 leads.
- Molded versions available in 8, 14, 16, 18, and 24 lead packages.
- Conformally coated versions containing any even number of leads from 4 to 64.
- Screened to MIL-STD-883, method 5008, class B or S; or MIL-R-83401.
- Semi-standard; no artwork required.

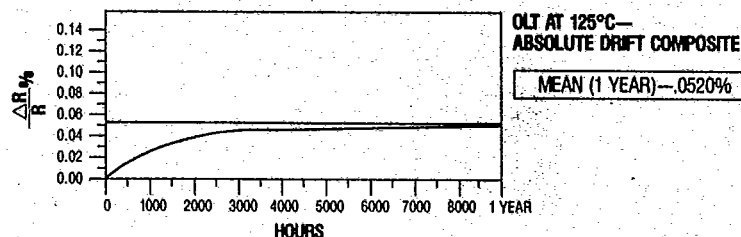
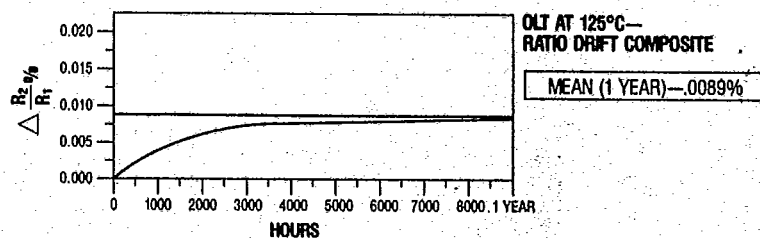
## ELECTRICAL SPECIFICATIONS

EFI's selection of DIP networks provides excellent long-term stability, a large range of resistance values and high performance over a wide range of environmental conditions.

- Absolute accuracy:  $\pm 20\%$  to  $\pm 0.05\%$ .
- Ratio match:  $\pm 1.0\%$  to  $\pm 0.005\%$ .
- Operating temperature range: Commercial  $0^\circ\text{C}$  to  $70^\circ\text{C}$ , Military  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ .
- Absolute TCR:  $\pm 50$  ppm/ $^\circ\text{C}$  to  $\pm 10$  ppm/ $^\circ\text{C}$ .
- Ratio TCR tracking:  $\pm 5$  ppm/ $^\circ\text{C}$  to  $\pm 0.5$  ppm/ $^\circ\text{C}$ .
- Resistance values: Any combination of values from  $10\Omega$  to  $1M\Omega$ .

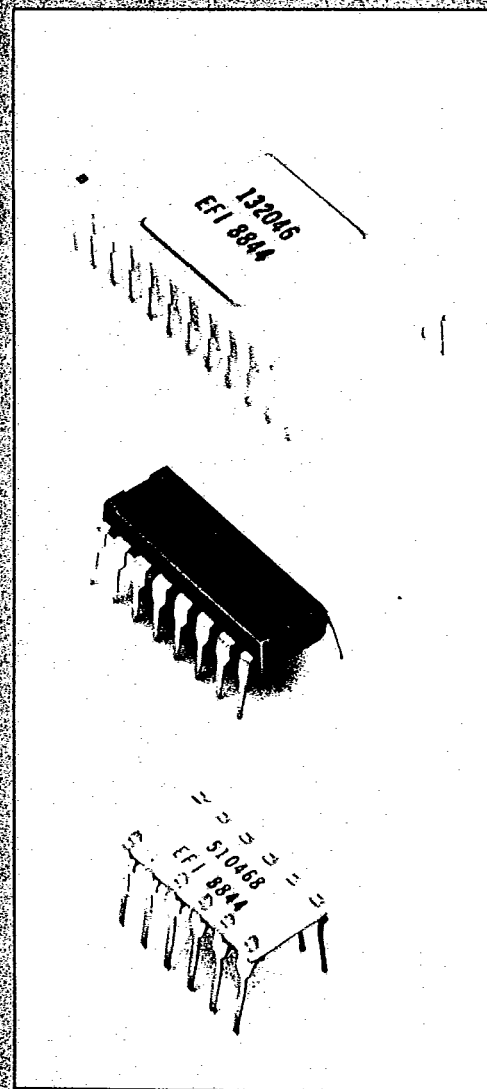
## LONG-TERM STABILITY

EFI's new enhanced metalization ensures excellent stability and low drift. The results of extensive  $125^\circ\text{C}$  operating life tests are illustrated below. EFI's unique process yields typical absolute drifts of  $0.03\%$  @ 1000 hrs. and  $0.052\%$  @ 1 year; and typical mean ratio drifts of  $0.003\%$  @ 1000 hrs. and  $0.0089\%$  @ 1 year.



## DIP PRECISION THIN-FILM RESISTOR NETWORKS

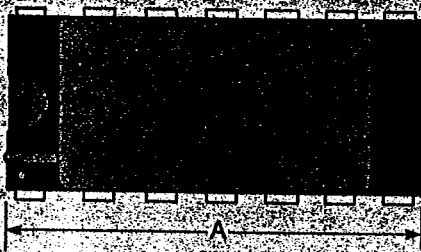
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**Electro-Films Inc.**

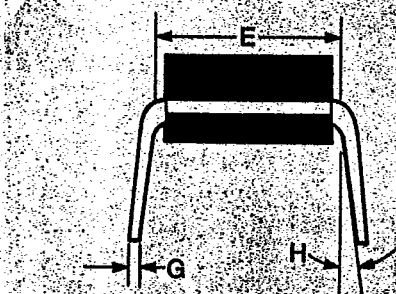
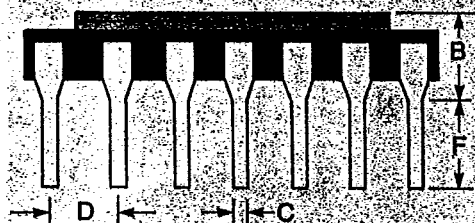
111 Gilbane Street  
Warwick, RI 02886  
(401) 738-9150  
TWX 710-482-0405  
FAX (401) 738-4389

# MECHANICAL SPECIFICATIONS



## MOLDED

| NO LEADS | A     | B     | C     | D     | E     | F     | G     | H   |
|----------|-------|-------|-------|-------|-------|-------|-------|-----|
| 8-LEAD   | 0.400 | 0.160 | 0.018 | 0.100 | 0.300 | 0.125 | 0.012 | 10° |
| 14-LEAD  | 0.750 | 0.160 | 0.018 | 0.100 | 0.300 | 0.125 | 0.012 | 10° |
| 16-LEAD  | 0.750 | 0.160 | 0.018 | 0.100 | 0.300 | 0.125 | 0.012 | 10° |
| 18-LEAD  | 0.900 | 0.160 | 0.018 | 0.100 | 0.300 | 0.125 | 0.012 | 10° |
| 24-LEAD  | 1.250 | 0.160 | 0.018 | 0.100 | 0.300 | 0.125 | 0.012 | 10° |



## HERMETIC

| NO LEADS | A     | B     | C     | D     | E     | F     | G     | H   |
|----------|-------|-------|-------|-------|-------|-------|-------|-----|
| 8-LEAD   | 0.400 | 0.160 | 0.018 | 0.100 | 0.300 | 0.170 | 0.012 | 10° |
| 14-LEAD  | 0.700 | 0.160 | 0.018 | 0.100 | 0.300 | 0.150 | 0.012 | 10° |
| 16-LEAD  | 0.800 | 0.160 | 0.018 | 0.100 | 0.300 | 0.150 | 0.012 | 10° |
| 18-LEAD  | 0.900 | 0.160 | 0.018 | 0.100 | 0.300 | 0.150 | 0.012 | 10° |
| 24-LEAD  | 1.200 | 0.160 | 0.018 | 0.100 | 0.600 | 0.150 | 0.012 | 10° |

\*NOTE: All package dimensions are nominal values.  
ALL DIMENSIONS IN INCHES

## APPLICATIONS

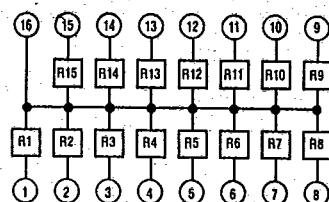
EFI's custom precision thin-film DIP networks provide system designers with a convenient answer to circuits whose performance depends critically on the relationships between two or more resistors. Their initial moderate cost, plus savings in areas such as: purchasing, inventory control, assembly, test, and board space, make these networks suitable for a multitude of applications. The following is only a small sample of applications where EFI precision thin-film networks can be employed:

- Programmable gain amplifiers.
- Comparators.
- Voltage dividers.
- Matched pairs or quads.
- Operational amplifier feedback networks which require a stable gain over a wide temperature range.

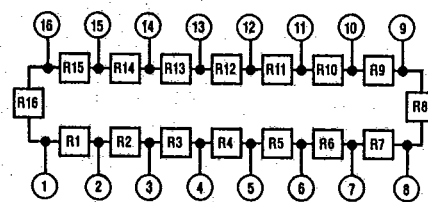
## ORDERING INFORMATION

The following information must be furnished with each order: Network Type, Package Type, Resistance Value for each position, Absolute Tolerance, Reference Resistor location (eliminate resistors where not required) and furnish a table as illustrated in the examples. Network types D1, D2 and D4 are shown for 16-pin packages. For packages with different numbers of pins use similar numbering.

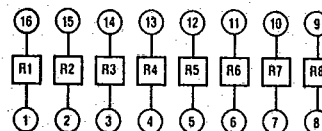
### STANDARD CONFIGURATIONS



D1 - COMMON CONNECTION



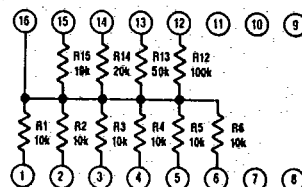
D2 - SERIES CONNECTION



D4 - ISOLATED CONNECTION

### EXAMPLE #1

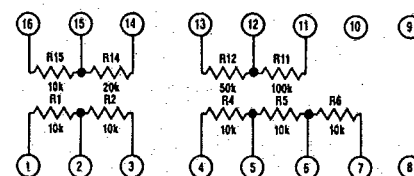
| NET. TYPE<br>D1 |                 | PKG. TYPE<br>M               | NO. OF LEADS<br>16    |                           |
|-----------------|-----------------|------------------------------|-----------------------|---------------------------|
| Resistor        | Value<br>(OHMS) | Absolute<br>Tolerance<br>(%) | Reference<br>Resistor | Ratio<br>Tolerance<br>(%) |
| R1              | 10kΩ            | 1.0                          | —                     | —                         |
| R2-R6,R15       | 10kΩ            | 1.0                          | R1                    | 0.01                      |
| R14             | 20kΩ            | 1.0                          | R1                    | 0.01                      |
| R13             | 50kΩ            | 1.0                          | R1                    | 0.01                      |
| R12             | 100kΩ           | 1.0                          | R1                    | 0.01                      |



RESULTING NETWORK

### EXAMPLE #2

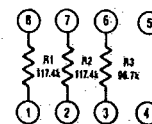
| NET. TYPE<br>D2 |                 | PKG. TYPE<br>C               | NO. OF LEADS<br>16    |                           |
|-----------------|-----------------|------------------------------|-----------------------|---------------------------|
| Resistor        | Value<br>(OHMS) | Absolute<br>Tolerance<br>(%) | Reference<br>Resistor | Ratio<br>Tolerance<br>(%) |
| R1              | 10kΩ            | 0.1                          | —                     | —                         |
| R2-R6,R15       | 10kΩ            | 0.1                          | R1                    | 0.02                      |
| R13             | 20kΩ            | 0.1                          | R1                    | 0.02                      |
| R11             | 50kΩ            | 0.1                          | R1                    | 0.02                      |
| R10             | 100kΩ           | 0.1                          | R1                    | 0.02                      |



RESULTING NETWORK

### EXAMPLE #3

| NET. TYPE<br>D4 |                 | PKG. TYPE<br>C               | NO. OF LEADS<br>8     |                           |
|-----------------|-----------------|------------------------------|-----------------------|---------------------------|
| Resistor        | Value<br>(OHMS) | Absolute<br>Tolerance<br>(%) | Reference<br>Resistor | Ratio<br>Tolerance<br>(%) |
| R1              | 117.4kΩ         | 0.1                          | —                     | —                         |
| R2              | 117.4kΩ         | 0.1                          | R1                    | 0.1                       |
| R3              | 58.7kΩ          | 0.1                          | R1                    | 0.1                       |
|                 |                 |                              |                       |                           |
|                 |                 |                              |                       |                           |



RESULTING NETWORK

**KEY**  
Package Type:  
H = Hermetic  
C = Coated  
M = Molded