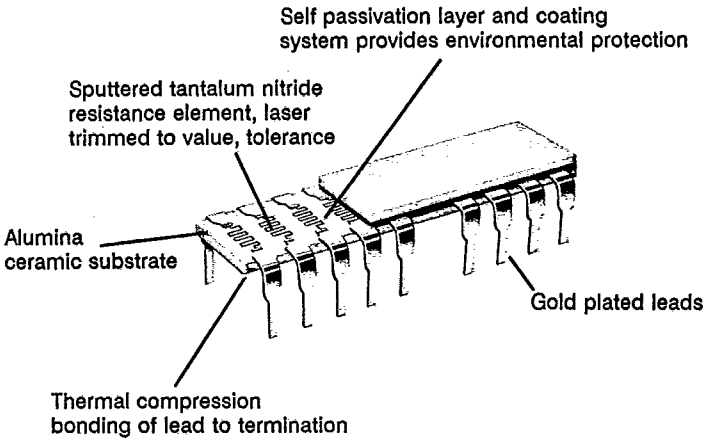
IRC

TANFILM R-2R LADDER
12-BIT, 20-PIN DIP

- Proven reliability
- 12 bit, ±1/2 LSB accuracy over 10,000 hour life
- Passivated TaNFilm for superior environmental performance
- ±122 ppm ladder accuracy over -55°C to +125°C
- Standard DIP package
- 5 standard R values



The 5430 series R-2R ladder utilizes the unique characteristics of the TaNFilm process to provide the 1/2 LSB, 12 bit accuracy required for precision data conversion. Our continuous sputtering process deposits Tantalum Nitride resistance film over an entire substrate of 99.5% pure alumina, ensuring virtually identical resistance temperature characteristics of all resistors in the ladder. This guarantees no degradation in ladder accuracy over the full military temperature range of -55°C to +125°C.

Passivation of the resistance film results in outstanding environmental performance. More importantly, since the aging process of this film results in a slight continuation of this passivation, all resistors change at the same rate. Consequently, voltage ratios required for ladder accuracy are very stable over long term, 10,000 hour load and temperature conditions.

Large area thermocompression bonding of gold plated leads eliminates the need for fine wire bonds and provides the ultimate in strength and reliability. In addition the combination of high alumina substrate for thermal conductivity and 1.5 mil minimum resistor line width enhances reliability for the most severe applications. Reliability and stability of TaNFilm networks are proven with years of MIL-R-83401 testing and qualification.

STABILITY:

TaNFilm 12 bit ladders exhibit ±122 ppm maximum voltage ratio error after the following tests (per MIL-R-83401 except as noted):

Operating Life:
1000 Hrs. Full Load 100°C
Short Time Overload:
10 Sec. 2.5 x Rated Voltage
Thermal Shock:
10 cycles - 65°C to +150°C
High Temperature Exposure:
100 Hrs. @ 125°C
Moisture Cycle, Load: 10 Days
Soldering Heat: 10 Sec. @ 260°C
Shock: 100 g's for 6 Milliseconds
Vibration: 20 g's
Terminal Strength: 4.5 Lbs.

Note 1 - Consult factory for other switch compensation.

Note 2 - Ratio matching of each application resistor to ladder out put resistance. Consult factory for other accuracy requirements.

SPECIFICATIONS:

Ladder Resistance Values (R):
5K, 10K, 20K, 25K, 50K

Ladder Resistance Tolerance:
±5%

Maximum Input Voltage: 20V

Settling Time
(to 0.1% of final value):
100n sec.

Temperature Range:
-55°C to +125°C

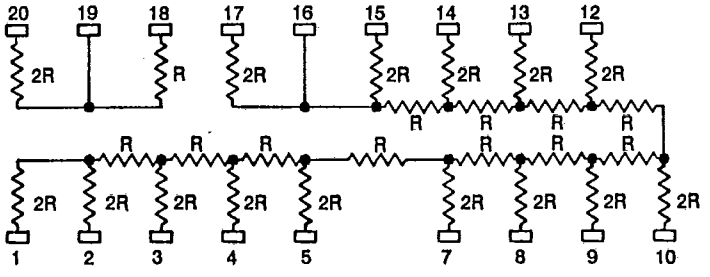
External Switch Compensation
(Note 1):
Models 5431-5434 - 5Ω
Model 5435 - 500Ω

Ladder Voltage Accuracy:
±122 ppm

Application Resistor Tolerance Ratio
(Note 2): 0.04%

Lead Material:
Gold plated copper alloy

STANDARD CIRCUIT:



Testing R-2R Ladder Networks

Conversion Accuracy Testing:

IRC tests its R-2R ladders functionally by comparing the output of the DUT (device under test) with the output of a standard ladder having an accuracy of .1 ppm. The ladder networks are activated one bit at a time, starting with bit one and continuing to the LSB (least significant bit). See Figure 1. A computer controlled scanner having low thermal mercury relays is used for the switching. The reference voltage being applied to the corresponding bit of each ladder (standard and DUT) is 10 volts. The output voltage error is measured using a computer control DVM and is stored in the computer memory. After all bits have been read, the plus and minus sums are found by adding the appropriate errors of all bits. Normally each of these sums must be less than one half the output of a perfect ladder with only its least significant bit energized. This is 122 ppm for 12 bit ladders. This procedure guarantees monotonicity and a worst case accuracy of less than 1/2 LSB.

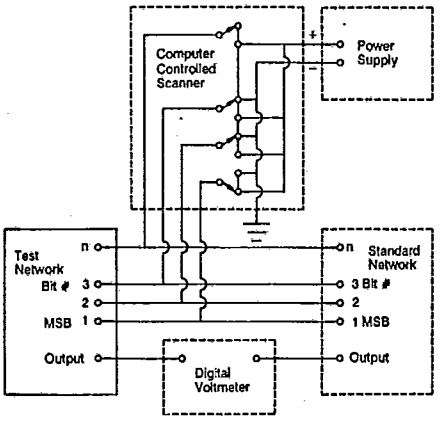
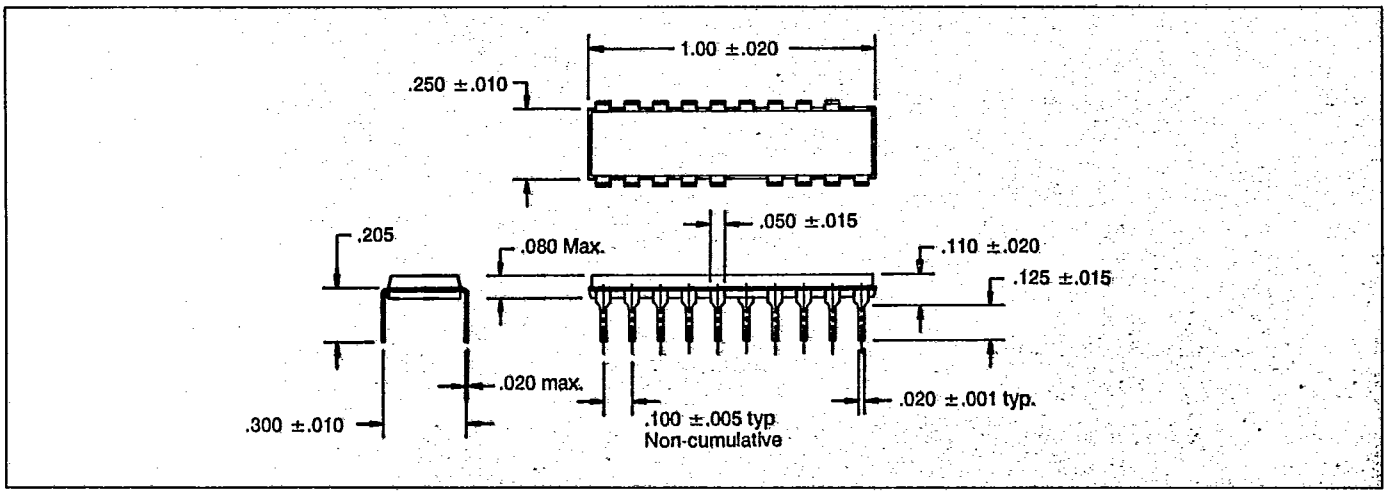


Figure 1. Conversion Accuracy Tester

Output Resistance Testing:

The output resistance is determined by making a single measurement. All bits are connected to common and the resistance between the "OUT" terminal and common is measured. The value will be the R value of the ladder. When switch compensation is accounted for, the output resistance is ±5% of the nominal value of R.

DIMENSIONS - INCHES:



HOW TO ORDER

Model	Description
5431	5/10K, 12 bit, 20 pin DIP, R-2R ladder
5432	10/20K, 12 bit, 20 pin DIP, R-2R ladder
5433	20/40K, 12 bit, 20 pin DIP, R-2R ladder
5434	25/50K, 12 bit, 20 pin DIP, R-2R ladder
5435	50/100K, 12 bit, 20 pin DIP, R-2R ladder

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