

James Galipeau
NASCENTechnology
Nov 16, 2010

85047

High Temperature Endurance Test

Abstract:

NASCENTechnology 85047 high-temperature inductors were subjected to a 1000 hr endurance test at 300 °C. All parts tested worked through the entire test and showed stability in their electrical parameters.

Equipment and Materials Used:

- Five 85047 parts from lot number 3549Y (02, 05, 23, 30, and 34)
- Wayne Kerr Precision Magnetic Analyzer 3260B
- Agilent 34970A Data Acquisition/Switch Unit with Agilent 34901A 20 channel Multiplexer and 34908A 40 channel Multiplexer cards
- A windows PC running a custom Visual Basic 6 program to operate the Magnetic Analyzer and the Data Acquisition Unit and record data.
- Lucas Milhaupt 95 Cd/5 Ag (BR 053 TEC) solder
- Twenty, 2' lengths of York Wire & Cable Inc 20 gauge MG high temperature lead wire
- Schindler Electric 0-758-D Furnace
- A Tool Shop butane pencil welding torch
- A ceramic block
- Five sets of 24 gauge twisted pair leads with hook clip ends
- K-type Thermocouple and wire
- Omega Thermocouple calibrator

Method:

The offset of the thermocouple port in the Agilent 34908A card was measured using the Thermocouple calibrator. The offset was found to be 5 °C.

The hightemperature wire was twisted into pairs to reduce tension on the part terminals. One end of each of these twisted pairs was soldered onto a part using the butane pencil welding torch and BR 053 TEC solder. The parts and wire were placed in the furnace such that the wire ran over the ceramic block about an inch away from the parts. This allowed the parts to be suspended in the furnace near the thermocouple hooked up to the data acquisition unit. The other end of the high-temperature wire was run through a bulk head to the outside of the furnace.

The measurement channels on the Wayne Kerr Magnetics Analyzer were connected to the output channels on the Agilent 34901A using coaxial cable. The unclipped ends of the twisted pair leads were connected to input channels on the Agilent 34901A. The Magnetics Analyzer and Data Acquisition Unit setup was then calibrated using the Visual Basic 6 program and the Magnetics Analyzer's built in calibrate function. The hook ends of the twisted pair wires were then clipped to the high temperature wire.

The furnace was programmed to come to temperature in two and a half hours and then hold at 300 °C until turned off. The custom data logging software was started after the furnace had come to temperature and run for 60390 minutes. Resistance and inductance data for each part were measured every 30 minutes except when the data logging software crashed.

Results:

The first 120 minutes of test data was ignored as the thermocouple nearest the parts indicated that the temperature was a few degrees lower than 300 °C during this period. The parts showed stability in electrical characteristics over the remaining test period of 60270 minutes or just over 1004 hrs. Resistances for all parts are combined together in Figure 1. Table 1 shows the average resistance value, standard deviation and the 99.8 % data spread as a percent of the average.

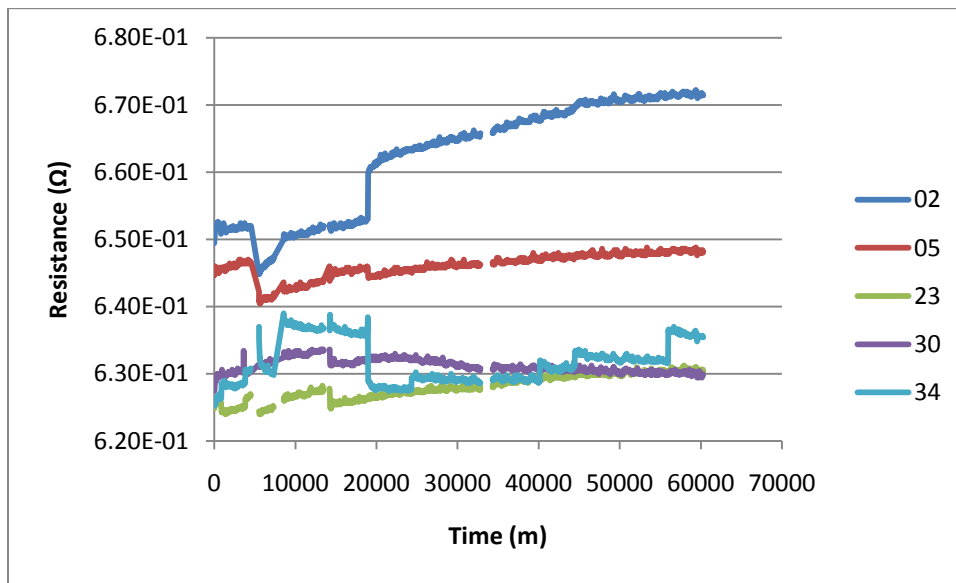


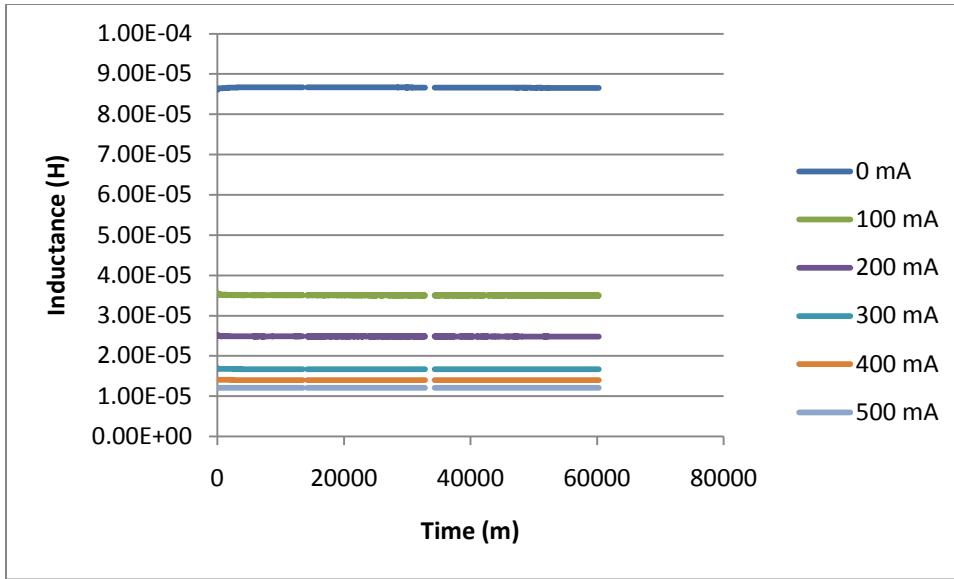
Figure 1. Resistance vs time plot for parts

Table 1. Average resistance values, standard deviation, and data spread as a percent of average

Part	02	05	23	30	34
Average	0.663	0.646	0.628	0.631	0.632
σ	8.11E-3	1.76E-3	1.85E-3	9.87E-4	3.18E-3
Data Spread	3.7 %	0.8 %	0.9%	0.5%	1.5%

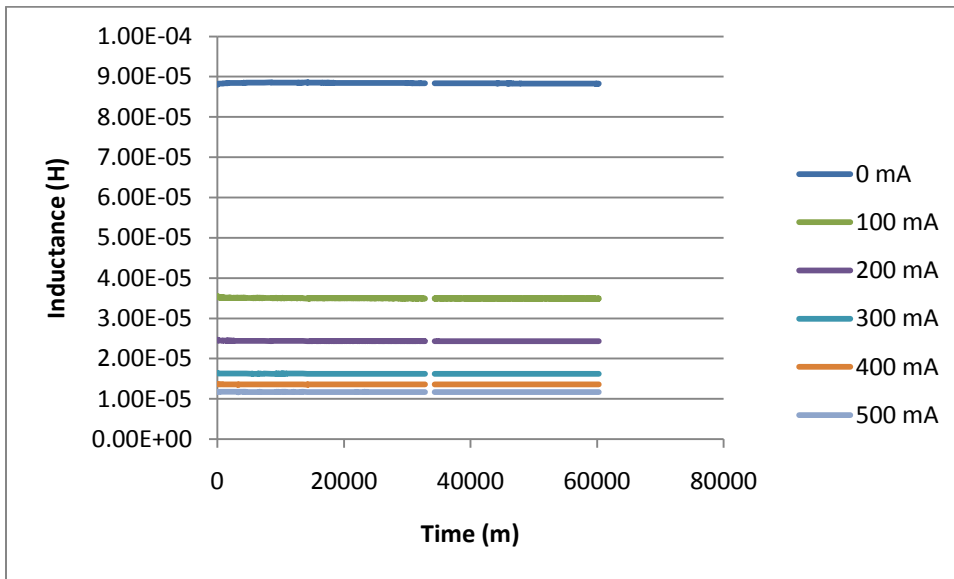
The Figures below show inductance vs temperature for various bias currents, and the corresponding Tables show average inductance for the bias currents, standard deviation of the data from the average, and the 99.8 % data spread as a percentage of the average.

Inductance vs temperature for part 02



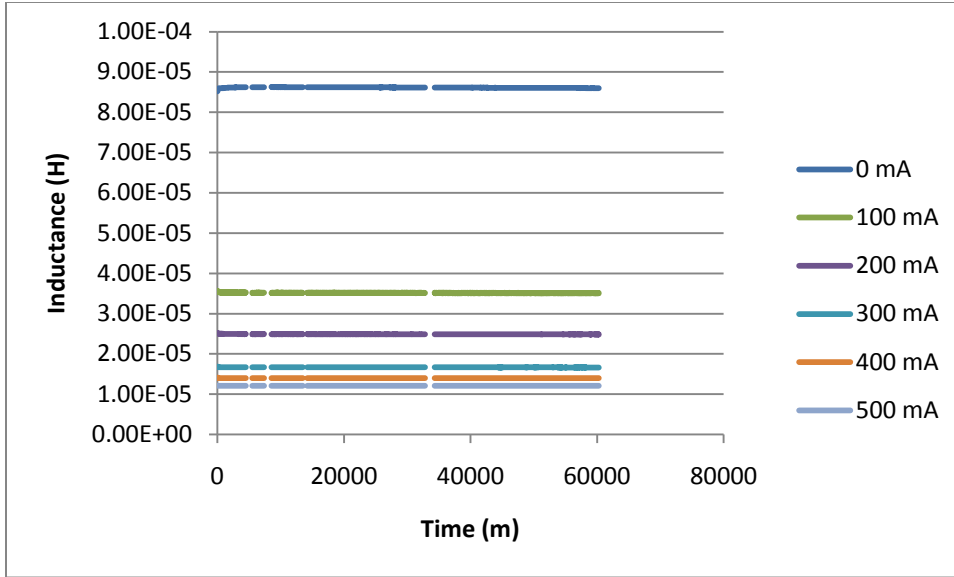
Bias	0 mA	100 mA	200 mA	300 mA	400 mA	500 mA
Average	8.66E-05	3.50E-05	2.48E-05	1.67E-05	1.40E-05	1.21E-05
σ	6.69E-08	5.96E-08	3.15E-08	1.74E-08	1.08E-08	7.19E-09
Data Spread	0.23%	0.51%	0.38%	0.31%	0.23%	0.18%

Inductance vs temperature for part 05



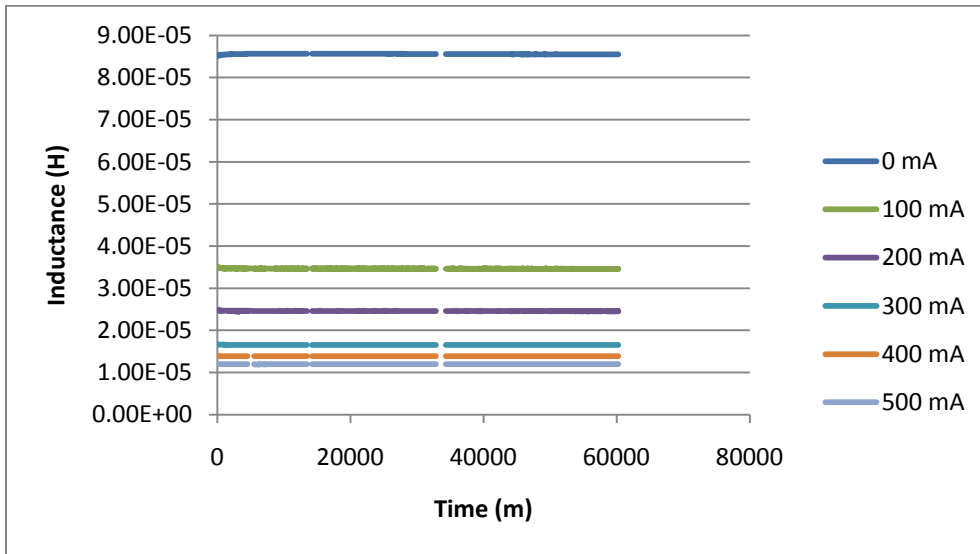
Bias	0 mA	100 mA	200 mA	300 mA	400 mA	500 mA
Average	8.84E-05	3.50E-05	2.44E-05	1.62E-05	1.36E-05	1.17E-05
σ	8.2E-08	7.28E-08	3.94E-08	1.98E-08	1.29E-08	8.6E-09
Data Spread	0.28%	0.62%	0.48%	0.36%	0.28%	0.22%

Inductance vs Temperature part 23



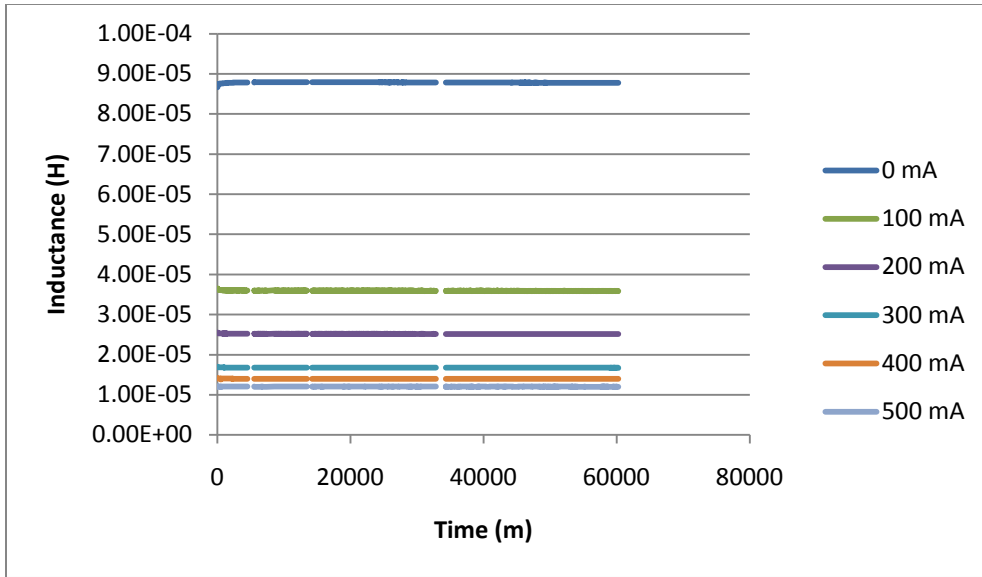
Bias	0 mA	100 mA	200 mA	300 mA	400 mA	500 mA
Average	8.61E-05	3.52E-05	2.49E-05	1.67E-05	1.40E-05	1.21E-05
σ	8.49E-08	6.12E-08	3.15E-08	1.62E-08	9.78E-09	6.52E-09
Data Spread	0.30%	0.52%	0.38%	0.29%	0.21%	0.16%

Inductance vs temperature part 30



Bias	0 mA	100 mA	200 mA	300 mA	400 mA	500 mA
Average	8.56E-05	3.46E-05	2.46E-05	1.65E-05	1.39E-05	1.20E-05
σ	6.16E-08	5.56E-08	3.02E-08	1.66E-08	1.08E-08	8.32E-09
Data Spread	0.22%	0.48%	0.37%	0.30%	0.23%	0.21%

Inductance vs Temperature for part 34



Bias	0 mA	100 mA	200 mA	300 mA	400 mA	500 mA
Average	8.78E-05	3.59E-05	2.52E-05	1.68E-05	1.40E-05	1.20E-05
σ	8.07E-08	6.37E-08	3.29E-08	1.74E-08	1.14E-08	7.73E-09
Data Spread	0.28%	0.53%	0.39%	0.31%	0.25%	0.19%