



BI Technologies
Nichrome thin film resistor networks

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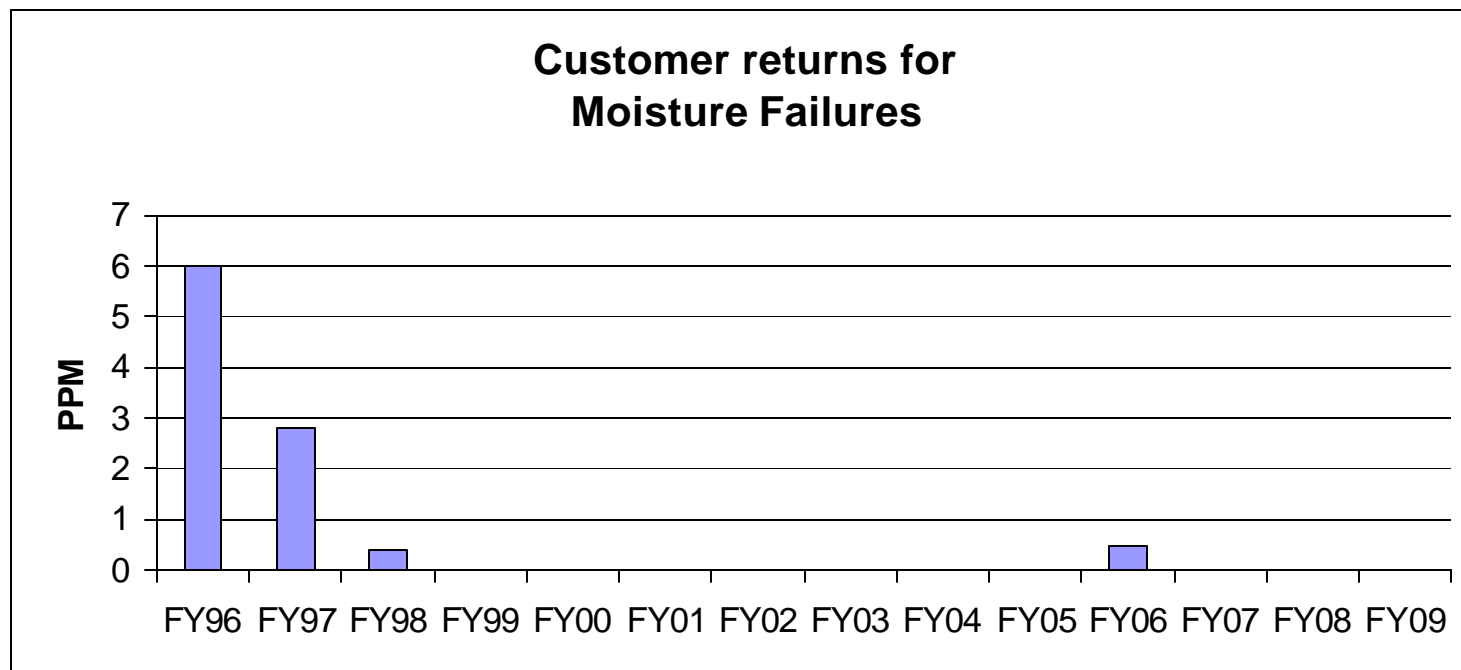
BI's Nichrome Networks are Moisture Resistance

- BI introduced a new Passivation system in 1998
 - Since this time, all BI Nichrome (NiCr) resistor networks are passivated in this manner.
 - The passivation material has extremely low water absorption rate, only increasing by 0.17% in weight when exposed to 85% relative humidity (RH).
 - The passivation contains very low levels of impurities, including ionic materials such as chlorine.
 - Our passivated thin film resistor networks pass the “water drop” test.
- Routine moisture test is performed at 85°C/85%RH for 1000 hrs.
 - Parts are tested under a bias voltage.
 - The bias voltage is kept low to prevent self heating.
 - Results show typical resistance shifts less than 0.25%.

Success of NiCr Passivation System

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Since 1999, we have only seen one moisture related failure out of tens of millions of networks shipped!



Passivation: Nichrome vs Tantalum Nitride Resistors

- Both NiCr and TaN resistor materials require passivation.
 - TaN passivation is Ta₂O₅.
 - » This layer is formed during the resistance stability bake.
 - » The stability bake process is critical for forming this passivation layer and for providing the desired resistor characteristics.
 - For NiCr resistors, the passivation material is applied as the final step in the wafer fabrication process.
 - » This process is a low temperature operation
 - » This process has little impact on the resistor characteristics.
- While our experience has shown that both passivation materials are effective, obtaining the desired resistor characteristics with TaN films is more difficult and problematic.

NiCr and TaN Resistors

- BI Technologies has produced both TaN and NiCr thin film resistors.
 - From experience, we have determined that the NiCr film provides better resistor characteristics than TaN film resistors.
 - NiCr also provides better process capabilities.
- See the following for a comparison of the two technologies...

Comparing NiCr and TaN Performance

Parameter	Units	NiCr	TaN
Resistivity	Ohms/sq	25 to 200	25 to 100
Temperature Coefficient of resistance (TCR)	PPM/°C	+/-10 to +/-50	+/-25 to +/-100
TCR Tracking	PPM/°C	<1	1 to 5
Thermal Stability (150°C/1000 hours)	%DR	+/-0.05	+/-0.1
Noise	dB	-35	-35
Load Life: 1000 hrs (Rated Power)	%DR	<0.05	<0.1
Absolute Tolerance	%	+/-0.025	+/-0.05
Ratio	%	+/-0.005	+/-0.02