NIC COMPONENTS CORP.

www.niccomp.com | technical support: tpmg@niccomp.com

Thick & Thin Film Resistors / Failure Mode Study

Cause	*Sources*	*Indications*	*Behavior*	*Remedy*
Electrical Overstress, AC current or Pulse current	Poor design choice or inappropriate component selection	▪ Self heating (I^2Rs) ▪ Discoloration over time ▪ In severe cases melting of solder alloy and component displacement	Increased resistance value or open condition	Alternate higher power rated component or revise circuit design
EDS	Pick & placement, secondary (reverse side) processing, ICT, PCB handling or labeling.	No external visual signs	Initially decreased resistance value, repeated application leads to increased resistance or open condition	EDS controls
Mechanical Stress	▪ Component test or taping ▪ Component placement ▪ Centering jaws ▪ Post reflow PCB shock ▪ Impact damage to PCB	▪ Damage to component body ▪ Opening of terminals or conductors	▪ Immediate or latent failure; increasing resistance value ▪ ICT failures	▪ Machine set-up, maintenance and operator training ▪ Placement pressure
Thermal Stress	▪ Hand Soldering ▪ PCB Rework ▪ Forced cooling – quenching	▪ Damage to component body ▪ Opening of terminals or conductors	▪ Immediate resistance value shift ▪ ICT failures	▪ Training and control ▪ Reduce heating – cooling rates
Operating Environment	▪ High humidity ▪ High temperature	Reduction of resistive element metallization as moisture penetrates into energized components	▪ Increased resistance value or open condition	▪ Upgrade to higher moisture resistant series (auto grade) ▪ PCB coatings or sealants
Intrinsic Defect	▪ Improper resistive element printing	No external visual signs	▪ Immediate resistance value shift upon exposure to soldering heat ▪ ICT failures	Printing controls for alignment, upgrade IPQC
Ionic or metal conduction	PC residues, flux residues, water type, saponifier, assembly aids, sealers or coatings & external sources	Electrochemical migration (dendrite growth) or corrosion	Decreased resistance over time, temperature and RH	IQC, alternate materials, cleaning upgrade and alternate sealers
Corrosion	Sulfur corrosion of silver (Ag) conductors when used in sulfurous environments	No external visual signs	Increased resistance value over time in field	▪ Use sulfur resistant version components (NRC-S series) ▪ PCB coatings or sealants

➔ Review your circuit requirements with NIC TPMG department/ tpmg@nicccomp.com