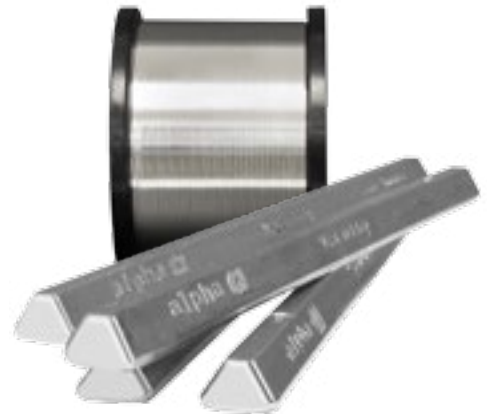




ALPHA® ECOSOL SOLDER ALLOY

The industry's first
low-melt point,
low-cost Pb-free
alloy for PV ribbon
tinning



ALPHA[®] EcoSol Solder Alloy for PV Ribbon Tinning

ALPHA EcoSol solder alloy is the PV industry's first Pb-Free alloy for Ribbon Tinning to have many of the same performance attributes of the more popular SnPb alloys and at a similar cost.

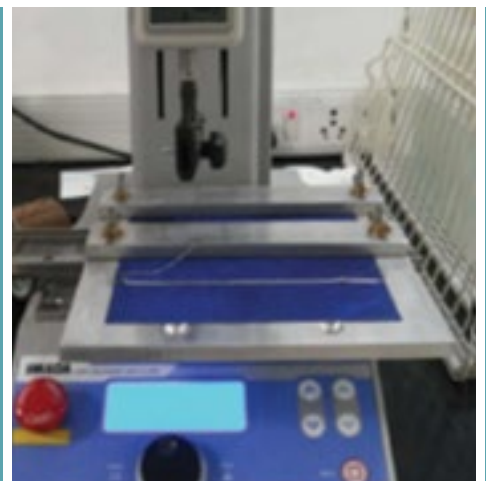
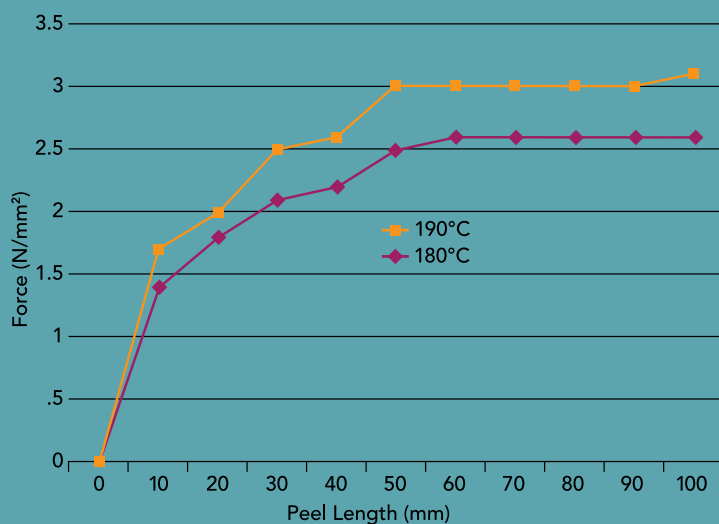
Finally, a Pb-Free alloy that:

- Costs >30% less than other Pb-Free alloys
- Reflows (melts) at temperatures near conventional, Pb-bearing alloys
- Has the mechanical, electrical and thermal conductivity properties required for use in cSi module assembly
- Can be "dropped in" to most current PV Ribbon tinning and cSi module assembly processes
- Passes IEC-61215 and 61730 reliability requirements

PROPERTIES DATA

MECHANICAL (as cast)	ALLOYS	
	EcoSol Alloy	60Sn40Pb
Liquidus Temp °C	179.7	193
Density (g/cm ³)	8.14	8.49
Tensile Strength (MPa)	240.5	236
Yield Strength (MPa)	69.3	64.3
Elongation (%)	29	31.2
Hardness (HV)	23	16
CONDUCTIVITY (coated Cu)	EcoSol Alloy	60Sn40Pb
Resistivity (ohms/cm)	2.07	2.33

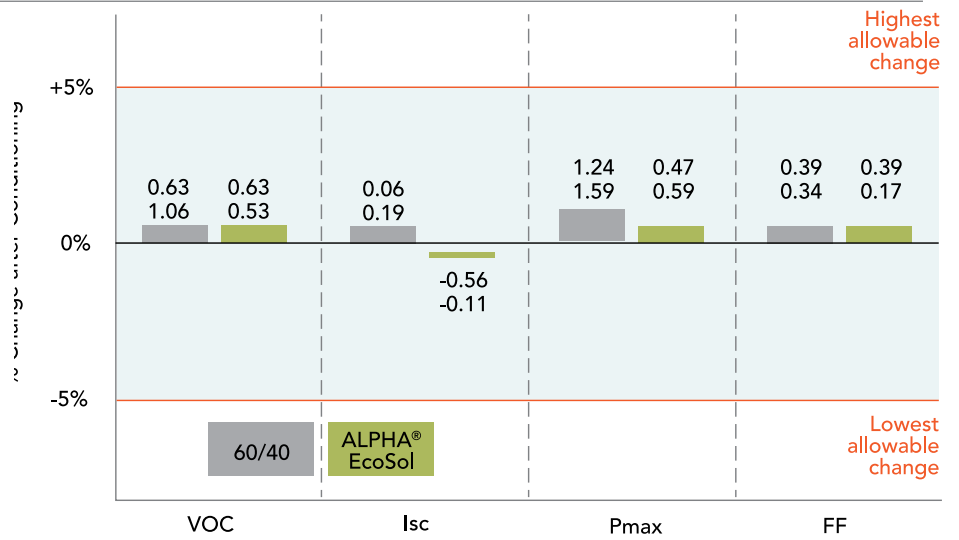
ALPHA[®] EcoSol DELIVERS EXCELLENT PEEL TEST RESULTS AT SOLDERING TEMPERATURES WELL BELOW OTHER Pb-FREE ALLOYS



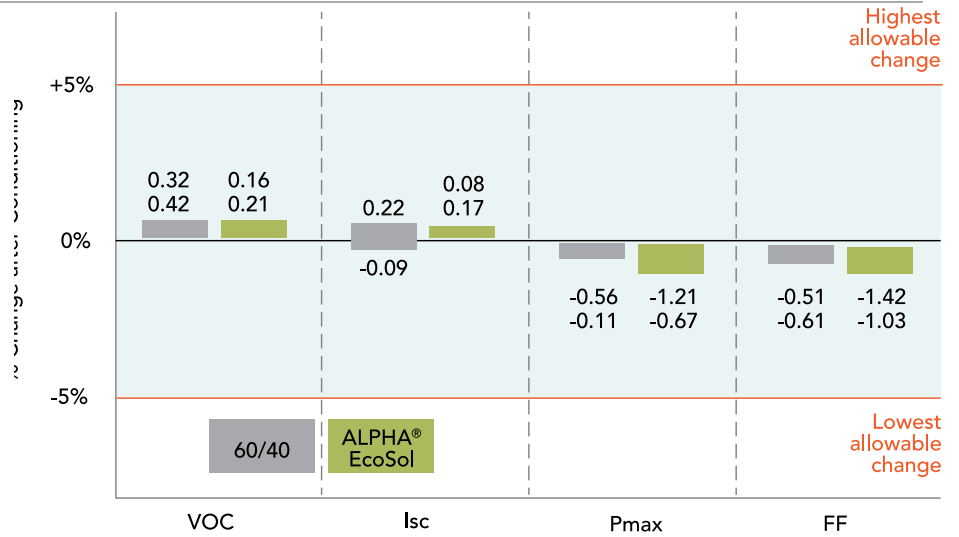
ALPHA® EcoSol
 SOLDER PASSES
 CRITICAL IEC-61215
 RELIABILITY TESTS.



DAMP HEAT TEST RESULTS
 2 MODULES FOR EACH ALLOY WERE TESTED

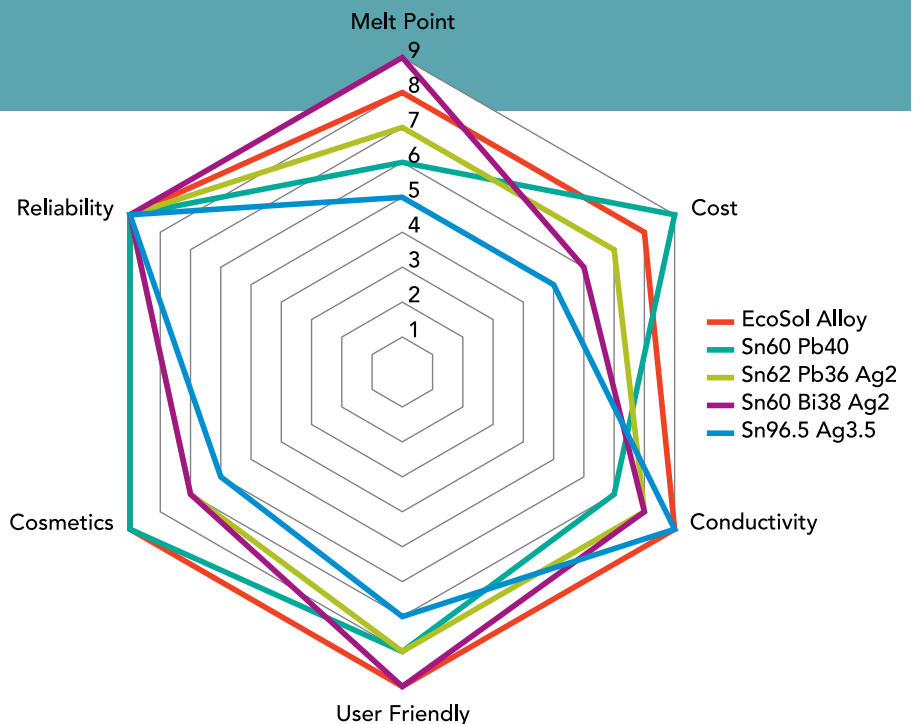


THERMAL CYCLING TEST RESULTS
 2 MODULES FOR EACH ALLOY WERE USED



ALPHA® EcoSol DELIVERS:

- Equivalent Reliability to current popular alloys
- Better Conductivity than current Ag-free alloys
- Lower Melt Point than most current popular alloys
- Excellent Cosmetics



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