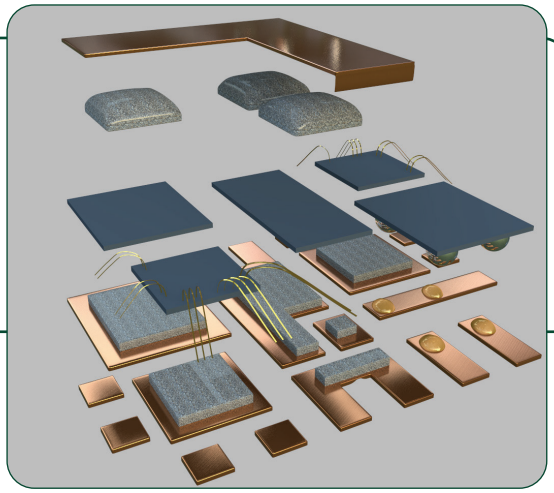
PRODUCT DATA SHEET

"Power-Safe" NC-SMQ75

Die-Attach Solder Paste

Introduction

Indium Corporation's **"Power-Safe" NC-SMQ75** is the world's first and only solder paste suitable for use in non-cleaned clip bond applications in power semiconductor die-attach. The ultra-low flux residue, combined with a benign, low reactivity flux chemistry, enables power semiconductor assemblers to eliminate the costs of cleaning completely in clipbond applications. It is suited for both print and dispense applications.



Features

- Ultra-low post-reflow residue <0.5%w/w of solder paste
- "Power-Safe" residue compatible with overmolding compounds without delamination
  – e.g., Hitachi 9420, Sumitomo G770
- Halogen-free
  – No halogens used in formulation
- Consistent dispensing deposit size without clogging
  – Powder Types 3, 4, 5, 6
- Airlessly syringe-packed (bubble-free) and jar pack available
- Wide range of alloy compatibility
- Reflow up to 400°C
  – Low oxygen or forming gas needed (<100ppmO_2)
- Low voiding for smaller die
  – < 6mm x 6mm
  – Meets <5% single, <10% total industry voiding standard
- Good wetting with common metal finishes
  – Leadframe: Cu, Cu spot-plate silver
  – Die: NiAg, NiAu, NiPdAu

Example Product Specifications

Alloy	Metal Content	Mesh Size	Particle Size	Rcommended Needle Size[1]
Sn10/Pb88/Ag2 Sn5/Pb92.5/Ag2.5 Sn5/Pb95 Sn5/Pb85/Sb10	88%	Type 3	25 to 45 microns (Type 3)	20 gauge*

BELLCORE and J-STD Tests & Results

Test	Result
J-STD-004 (IPC-TM-650)	
Flux Type Classification	ORL0
Presence of Halide Fluoride Spot Test	Pass
Elemental Analysis	Halogen-free
Post Reflow Flux Residue (ICA Test)	0.4% of solder paste
Corrosion	Pass
SIR (Post Clean)	Pass
Acid Value (Typical)	31.5
Test	**Result**
J-STD-005 (IPC-TM-650)	
Typical Solder Paste Viscosity (Pb92.5/Sn5/Ag2.5, Type 3, 88%) Brookfield (TF 5rpm) Brookfield (R7 10rpm)	 230kcps 170kcps
Slump Test	Pass
Solder Ball Test	Pass
Wetting Test	Pass
Standard Metal Load	88%

All information is for reference only.
Not to be used as incoming product specifications.

From One Engineer To Another®

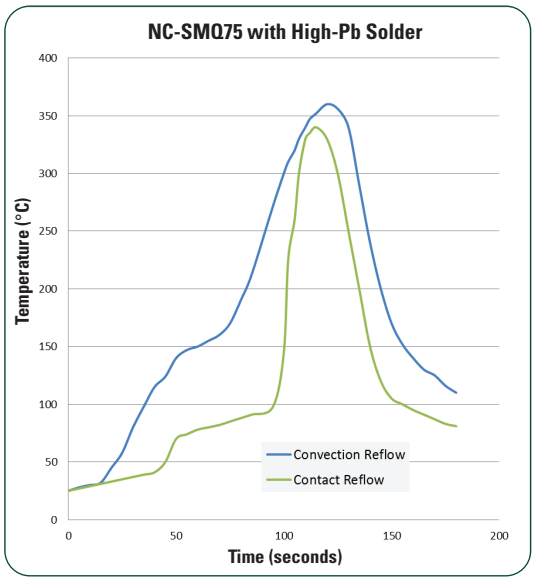
INDIUM CORPORATION®

PRODUCT DATA SHEET

"Power-Safe" NC-SMQ75 Die-Attach Solder Paste

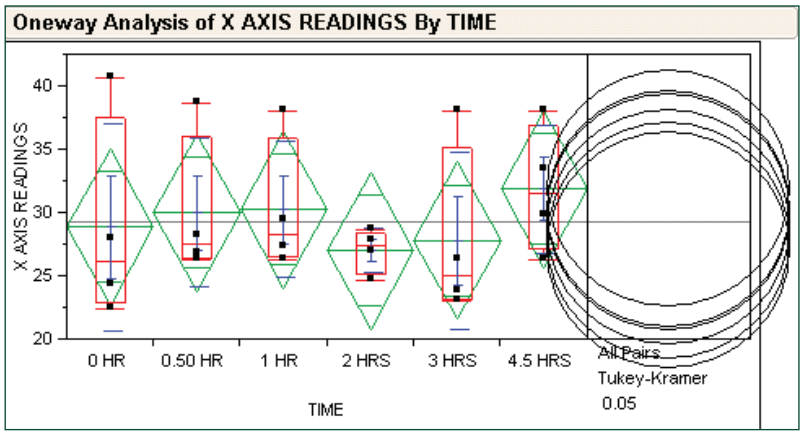
High-Pb Solder Reflow

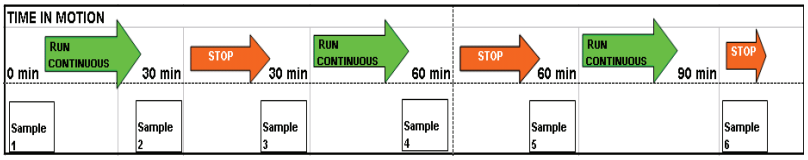
- Must be <100ppmO_2 in N_2 or H_2/N_2
- Spike: 320–390°C
- Higher temperature → lower voiding
- Minimum 15 seconds TAL
- Preheat plateau eliminates volatiles from flux



NC-SMQ75 Dispense Consistency

Statistically-based dispense trials showed no variation in deposit size, even after multiple start/stop cycles, including dispense after a 90-minute pause.





Standard Die-Attach Solder Paste Alloys

			Elemental %w/w					degC	
	Die-Attach Application	Comments	Sn	Ag	Sb	Au	Bi	Solidus	Liquidus
Pb-free	IGBT and modules	Low Tj IGBT usage	96.5	3.5				221	Eutectic
	Through-hole components	High reliability	65	25	10			233	340
		Lowest Sb level alloy	95		5			237	240
		Most common Sb-based alloy	90		10			243	257
		High tensile strength;high cost	20			80		280	Eutectic

								degC	
	Die-Attach Application	Comments	Sn	Ag	Sb	Pb	In	Solidus	Liquidus
Pb-containing		Step-soldering usage	5		10	85		240	256
	SMT components	Good tilt control		2.5		92.5	5	300	310
		Poor thermal cycling	10	2		88		268	290
		Automotive usage	5			95		308	312
			10			90		275	302
			5	2.5		92.5		287	296
			2	2.5		95.5		299	304

Commonly used alloy

Contact our engineers: askus@indium.com

Learn more: www.indium.com

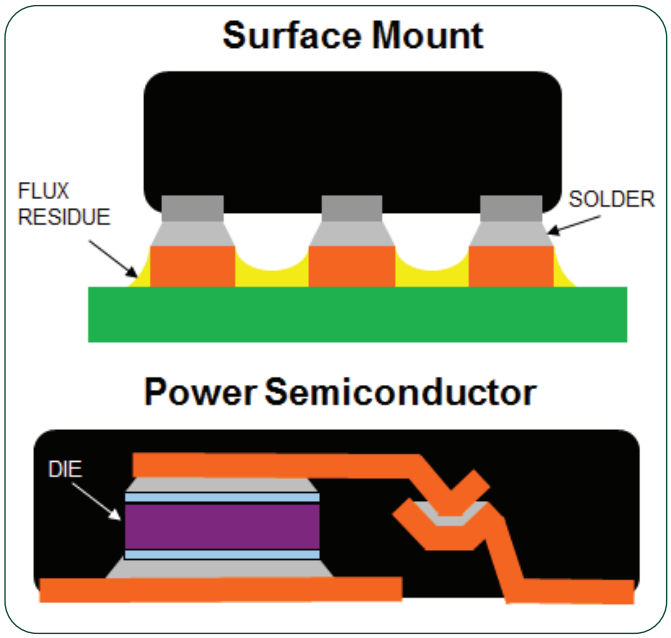
INDIUM CORPORATION®

PRODUCT DATA SHEET

“Power-Safe” NC-SMQ75 Die-Attach Solder Paste

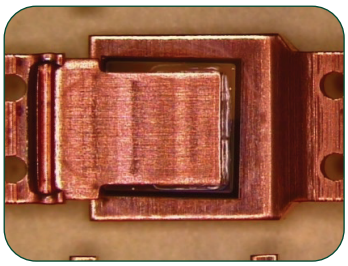
Why “power-safe” and not no-clean?

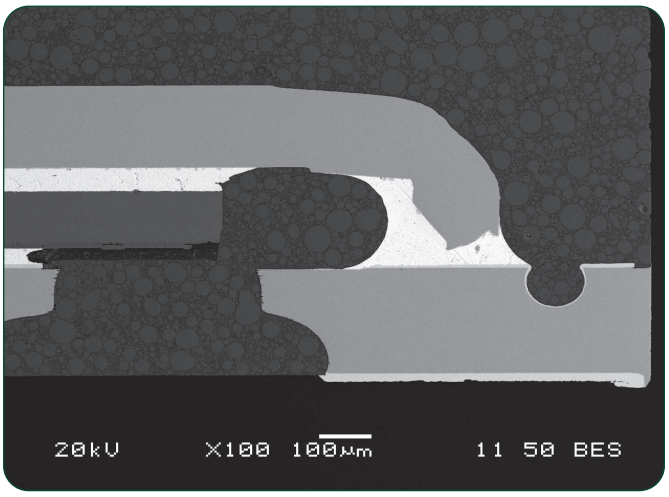
- **Possible concerns with flux residues**
  - Electrical “short” between adjacent conductors
    - Current leakage
    - Breakover voltage degradation
  - Contamination of wirebond pads
  - Interference with overmolding compound (OMC) adhesion
    - Delamination during MSL testing (JEDEC/IPC J-STD-020)
- **“Power-Safe” versus “No-Clean” terminology**
  - “No-clean”
    - Only for PCB assembly failure modes
      - Only standards are ANSI/IPC - PCB/SMT standards
      - No formal standard for semiconductor “no-clean”
  - “Power-Safe” term for customer-proven materials reliability
- **Device applicability**
  - “Power-safe” for selective non-wire bond applications, especially clip-bonding
  - Cleaning still dominant for wire bonded die



Compatibility with OMC NC-SMQ75

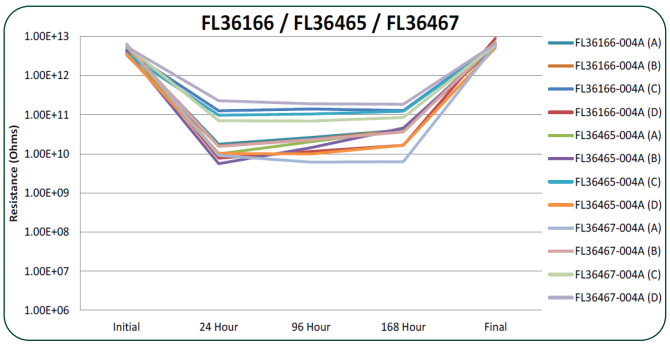
- Clip-bonded package
- 1,000 hours thermal cycle (-55°C–150°C)
- SEM of cross-section:
  - No evidence of flux residues
  - No delamination

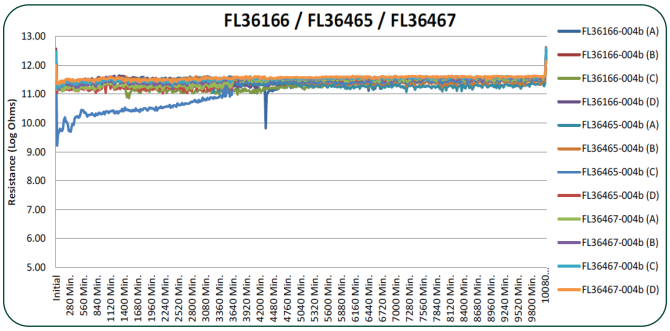




SIR Results

Surface insulation resistance (SIR) test is for SMT failure modes, but may be indicative of utility in “Power-Safe” applications.





Contact our engineers: askus@indium.com

Learn more: www.indium.com

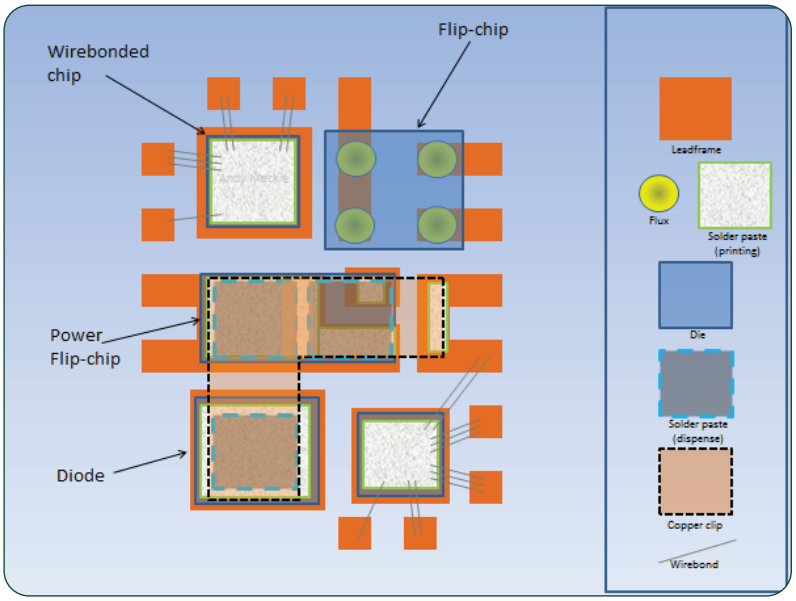
INDIUM CORPORATION®

PRODUCT DATA SHEET

“Power-Safe” NC-SMQ75 Die-Attach Solder Paste

Assembly Materials for PQFN Packages

- **Die-attach**
  - – High temperature Pb-free solder paste
- **Flip-chip on leadframe**
  - – Fluxes
    - • No-clean and water-wash
  - – Solder pastes
    - • Fine and ultra-fine pitch
      - – Types 4, 5, 5.5, 6, 6-SG,7



Other Materials

- Solder pastes
- Fluxes
- Thermal interface materials
- Preforms

All of Indium Corporation’s solder paste and preform manufacturing facilities are IATF 16949:2016 certified.
Indium Corporation is an ISO 9001:2015 registered company.

Contact our engineers: askus@indium.com
Learn more: www.indium.com
ASIA +65 6268 8678 • CHINA +86 (0) 512 628 34900 • EUROPE +44 (0) 1908 580400 • USA +1 315 853 4900