

PRODUCT DATA SHEET

“Power-Safe” NC-SMQ®75

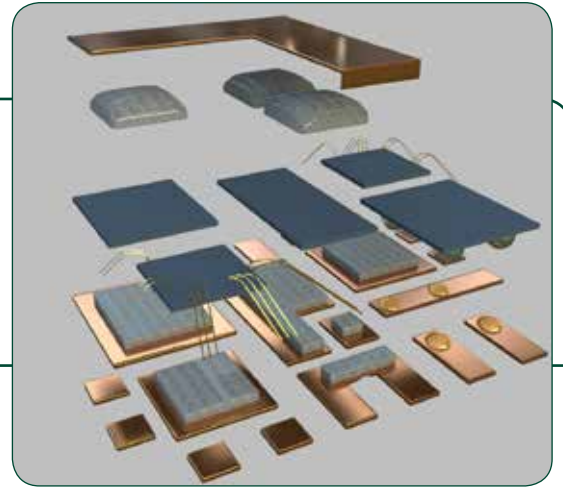
Die-Attach Solder Paste

Introduction

Indium Corporation’s “Power-Safe” NC-SMQ®75 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.

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)
- Wide range of alloy compatibility
- Reflow up to 400°C
 - Low oxygen or forming gas needed (<100ppmO₂)
- 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



BELLCORE and J-STD Tests & Results

Test	Result
J-STD-004 (IPC-TM-650)	
Flux Type Classification	ORLO
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.

Example Product Specifications

Alloy	Metal Content	Mesh Size	Particle Size	Recommended 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*

From One Engineer To Another®



"Power-Safe" NC-SMQ[®] 75 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
 - 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

Surface Mount

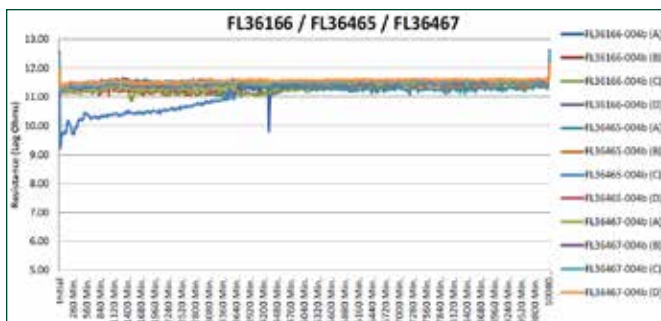
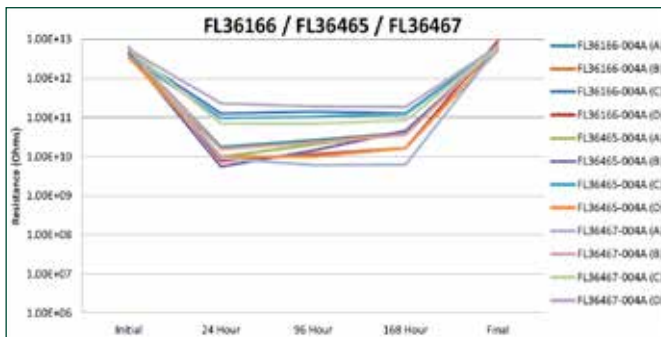


Power Semiconductor



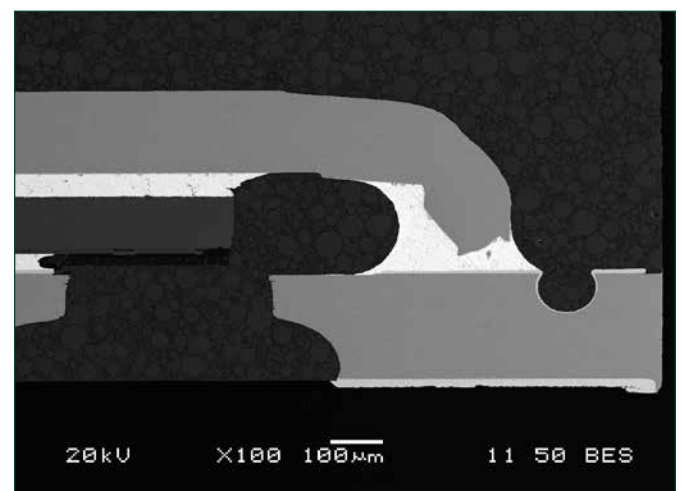
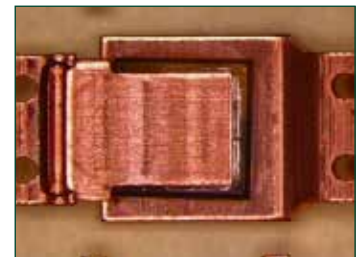
SIR Results

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



Compatibility with OMC NC-SMQ[®] 75

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



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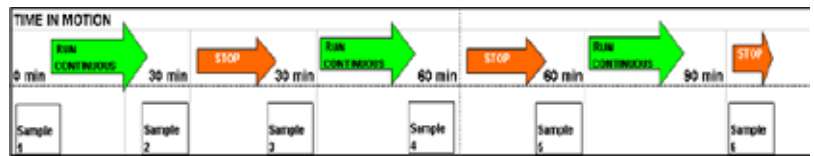
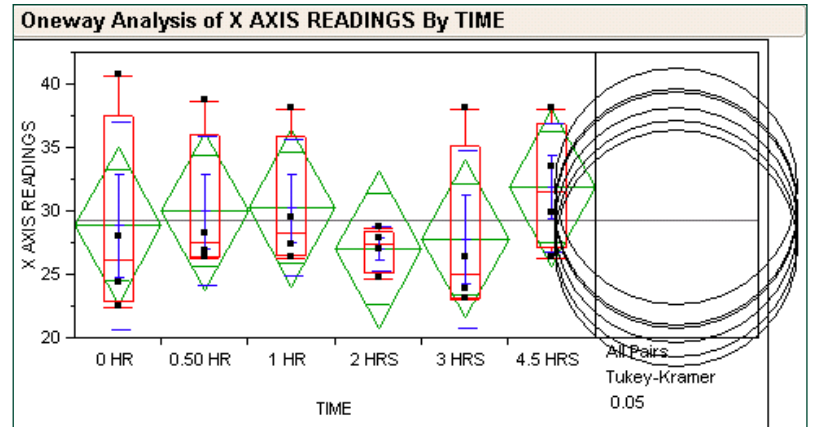
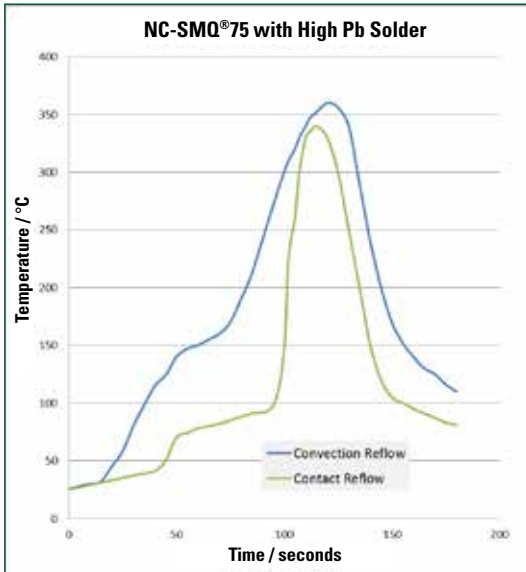
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High-Pb Solder Reflow

- Must be <100ppmO₂ in N₂ or H₂/N₂
- Spike: 320-390°C
- Higher temperature → lower voiding
- Minimum 15 seconds TAL
- Preheat plateau eliminates volatiles from flux

NC-SMQ[®] 75 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

Commonly used alloy

	Die-Attach Application	Comments	Elemental %w/w					degC	
			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
	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	

	Die-Attach Application	Comments	Sn	Ag	Sb	Pb	In	degC		
								Solidus	Liquidus	
Pb-containing	SMT components	Step-soldering usage	5		10	85		240	256	
		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		

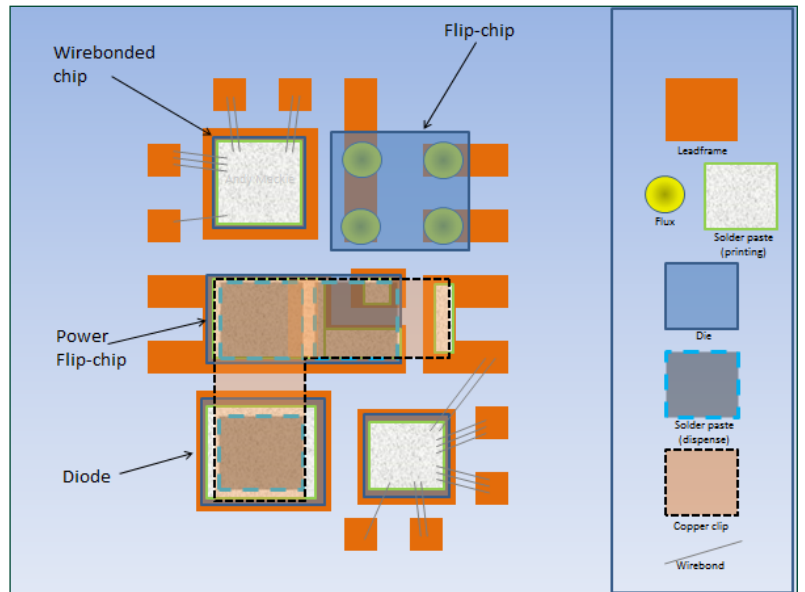


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Assembly Materials for PQFN Packages

- **Die-attach**
 - High temperature Pb-free solder paste
 - BiAgX[®]
- **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



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