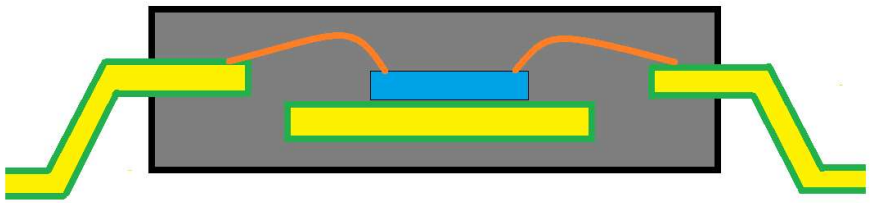
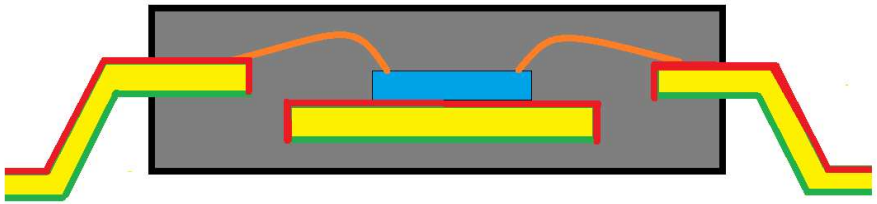
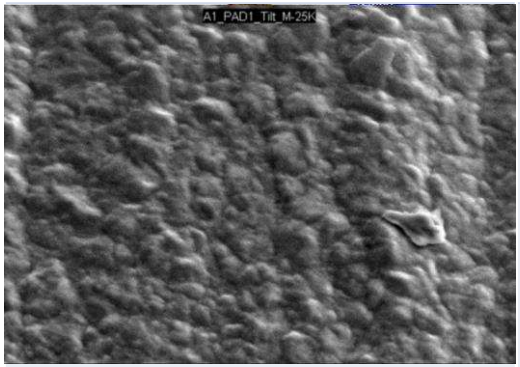
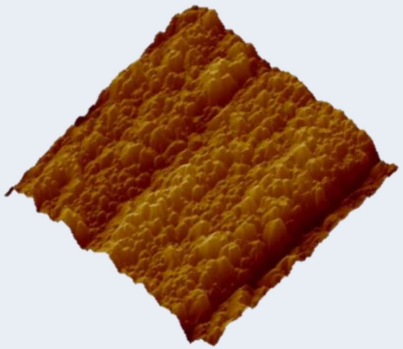
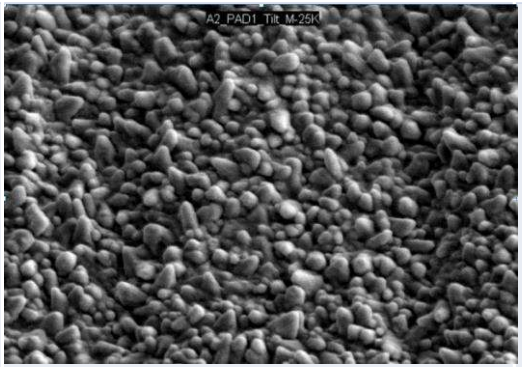
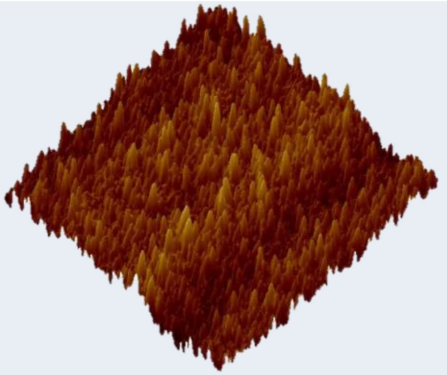
Application Note
Single Side Rough Leadframe

Single Side Rough Leadframe

- **Texas Instruments has introduced Rough Leadframe Technology to enhance the mechanical stability of the package.**
- **The purpose of this document is to:**
  - Explain the physical appearance of the single side rough surface finish
  - Show examples of automated optical inspection (AOI) differences
  - Indicate no surface mount technology (SMT) soldering impact

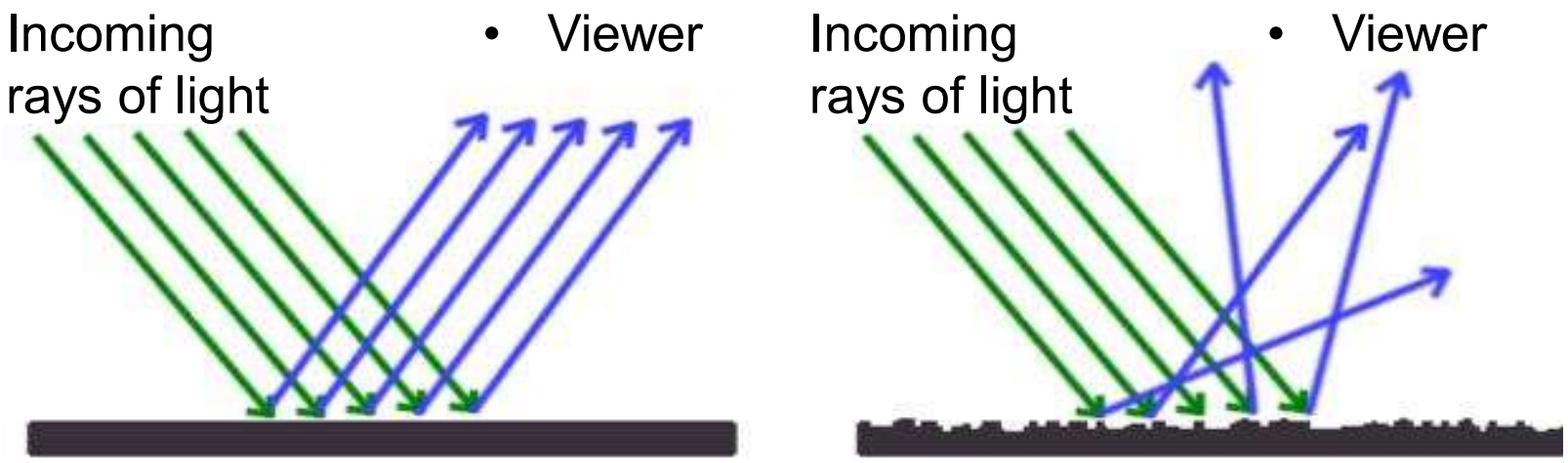
Non-Rough Pre-plated Leadframe **Base Cu** **non- rough NiPdAu finish**	
Rough Pre-plated Leadframe **Base Cu** **non- rough NiPdAu finish** **Rough NiPdAu finish**	

Non-Rough vs Rough Leadframe Surface

Non Roughen Leadframe		Roughen Leadframe	
SEM @25Kx	AFM	SEM @25Kx	AFM
			

- **The Roughening is created during the Leadframe manufacturing process and is confirmed by the Leadframe vendor using SEM and atomic force microscopy (AFM).**
- **The pre-plated finish on non-rough and rough Leadframes are identical NiPdAu.**
- **Roughening significantly increases the amount of contact area between the Leadframe surface and the package mold material, enhancing the interfacial strength.**

Rough Leadframe Darker Appearance

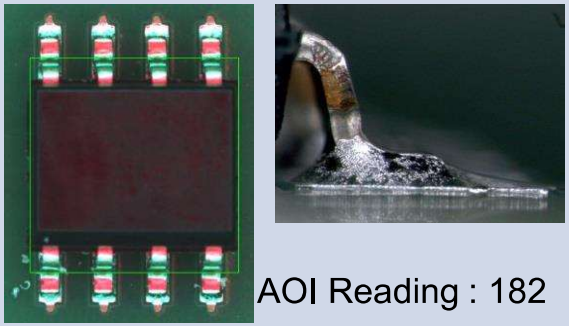
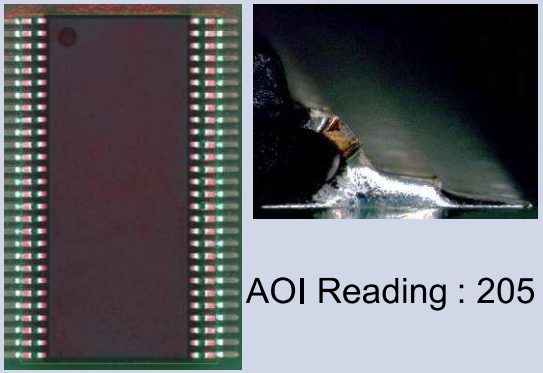
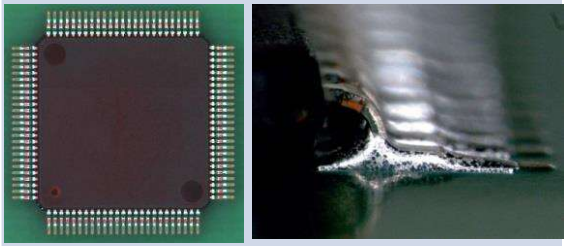
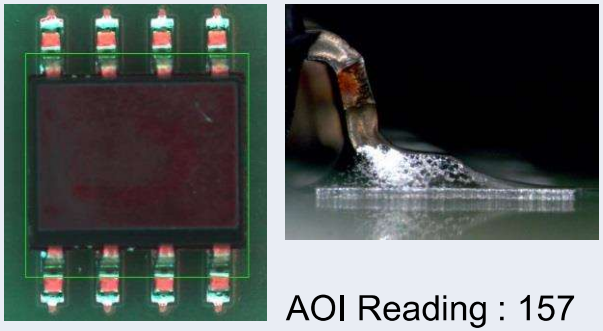
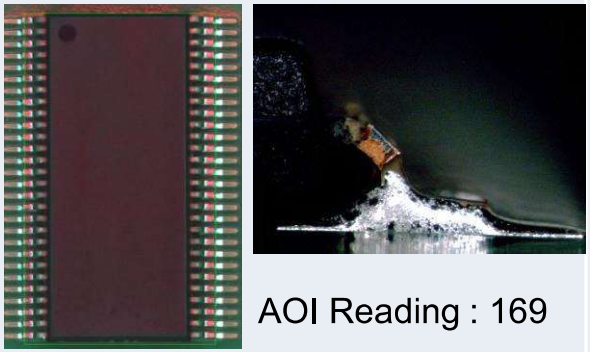
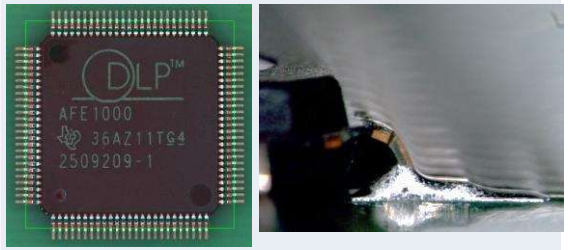


Smooth Surface
(Specular Reflection & Brighter)

Roughened Surface
(Diffused Reflection & Darker)

- **The non-Rough Leadframe's relatively smooth surface has a brighter appearance due to the predominant specular reflection.**
- **The Rough Leadframe's textured surface has a darker appearance due to the increased amount of diffused refection.**

Automatic Optical Inspection (AOI)

Package	SOIC	TSSOP	QFP
Non-Rough Leadframe	 AOI Reading : 182	 AOI Reading : 205	 AOI Reading : 211
Roughen Leadframe	 AOI Reading : 157	 AOI Reading : 169	 AOI Reading : 173

AOI scale is from 0~255

- **The Rough Leadframe's diffused light reflection is confirmed by the AOI lower brightness reading.**
- **Actual readings will vary dependent on the AOI tool and light settings.**

SMT Soldering Assessments

- No changes are required in either the PCB level assembly process flow or equipment settings for the Rough Leadframe.

Solder wicking comparison

non -Rough LF

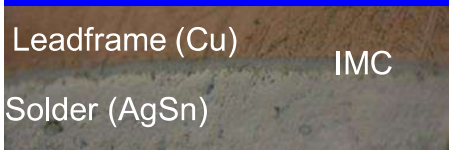
Rough LF

- No difference in solder wicking between non-rough and rough
- Meets IPC-A-610-E and JEDEC 22-B102E criteria

IMC comparison

Initial as soldered

non -Rough LF



Rough LF

Post 500 Temp Cycle

non -Rough LF

Rough LF

- No difference in IMC formation between non-rough and rough
- No change to solder joint reliability