



Introduction of an MLO with Excellent Geometric Stability



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Introduction

In semiconductor inspection equipment, pitch conversion is performed using space transformers. As pitch becomes finer, the use of MLO substrates increase; however, electrode positional accuracy and thermal dimensional stability remain as key challenges.

This study introduces an MLO structure that achieves excellent dimensional stability and flatness while reducing manufacturing lead time.

Items		Unit	Design	Structure
Structure	Layer Structure	–	36	
Material	Core	–	HS200 (D)	
	Prepreg	-	GH200 (D)	
	Conductive Paste	–	Sn-Ag-Cu	
	B to B Adhesive	-	Prepreg & Adhesive	
Design	Unit Size	mm	75x75	
	Substrate Thickness	mm	3	

Lincstech Technology

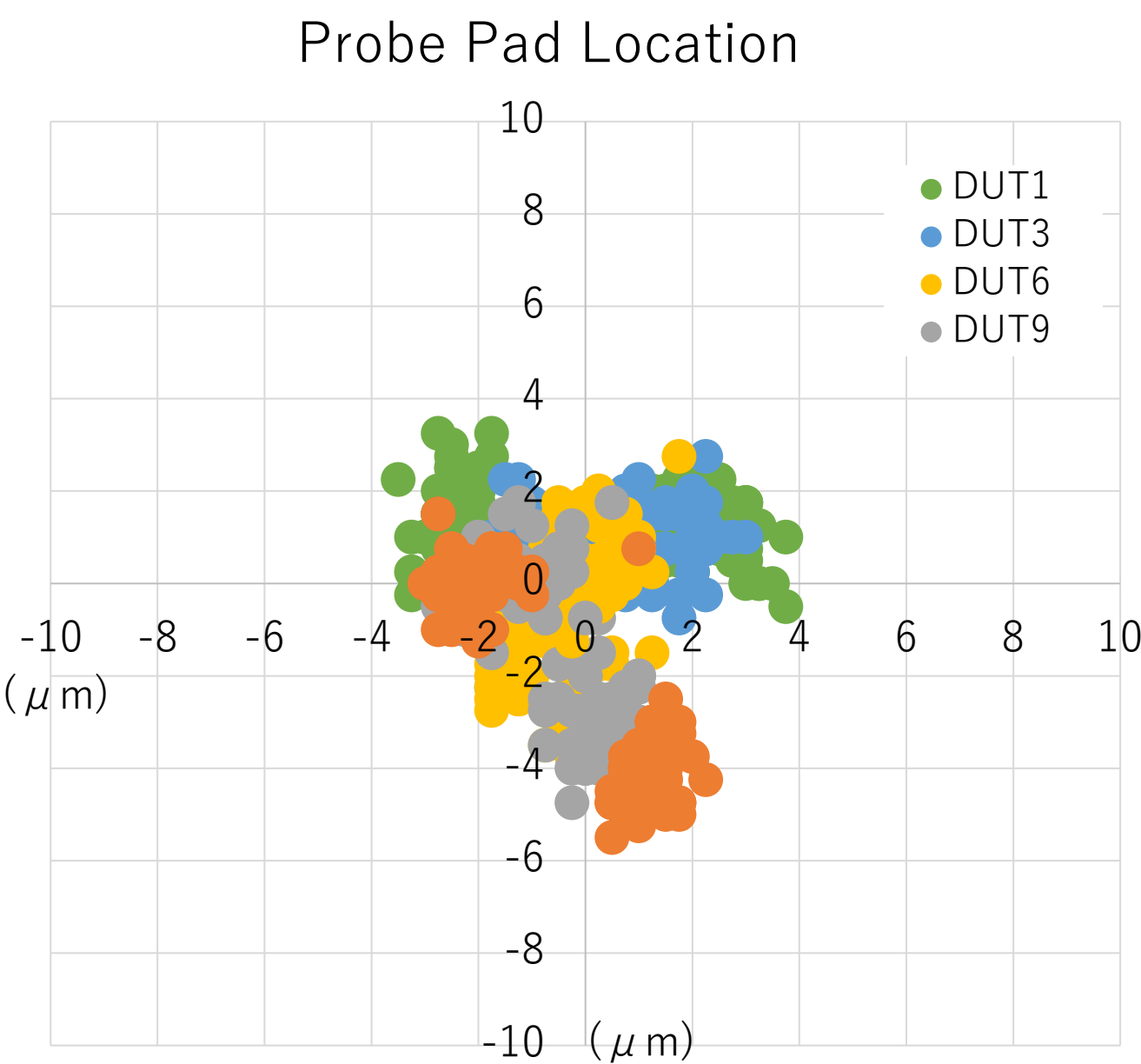
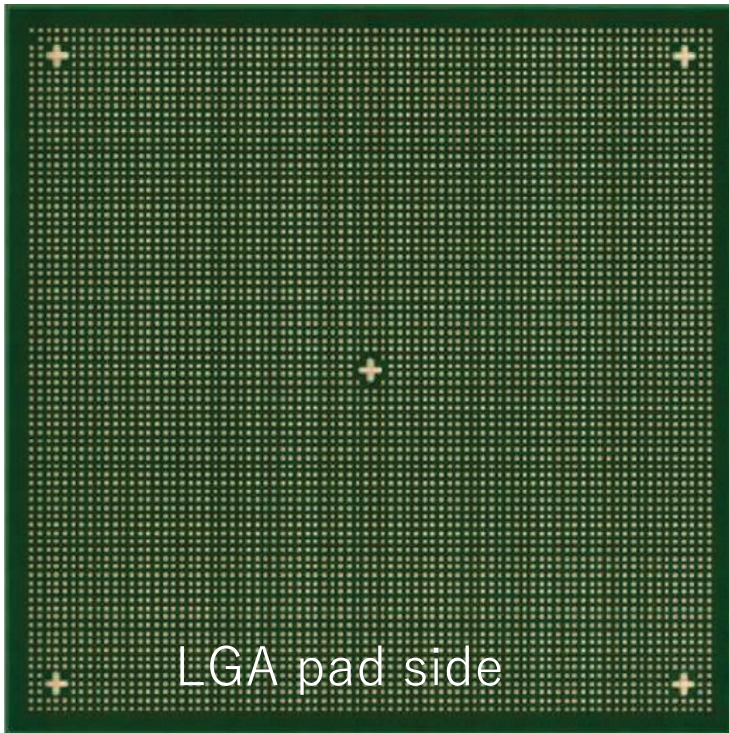
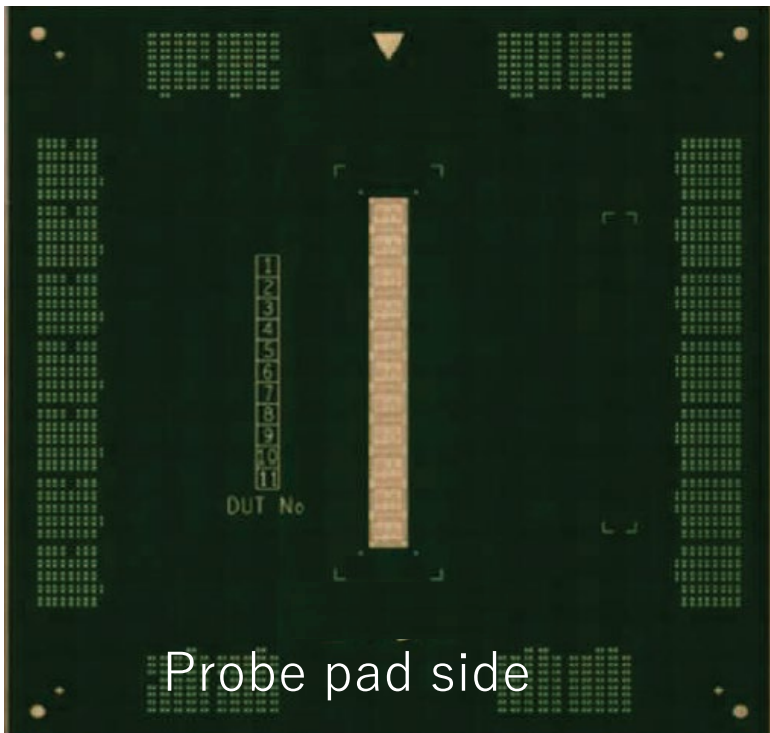
Materials, Process and Structure

The structure employs glass-cloth reinforced insulating layers, providing high mechanical strength and rigidity and ensuring stable dimensional behavior within assembly temperature ranges.

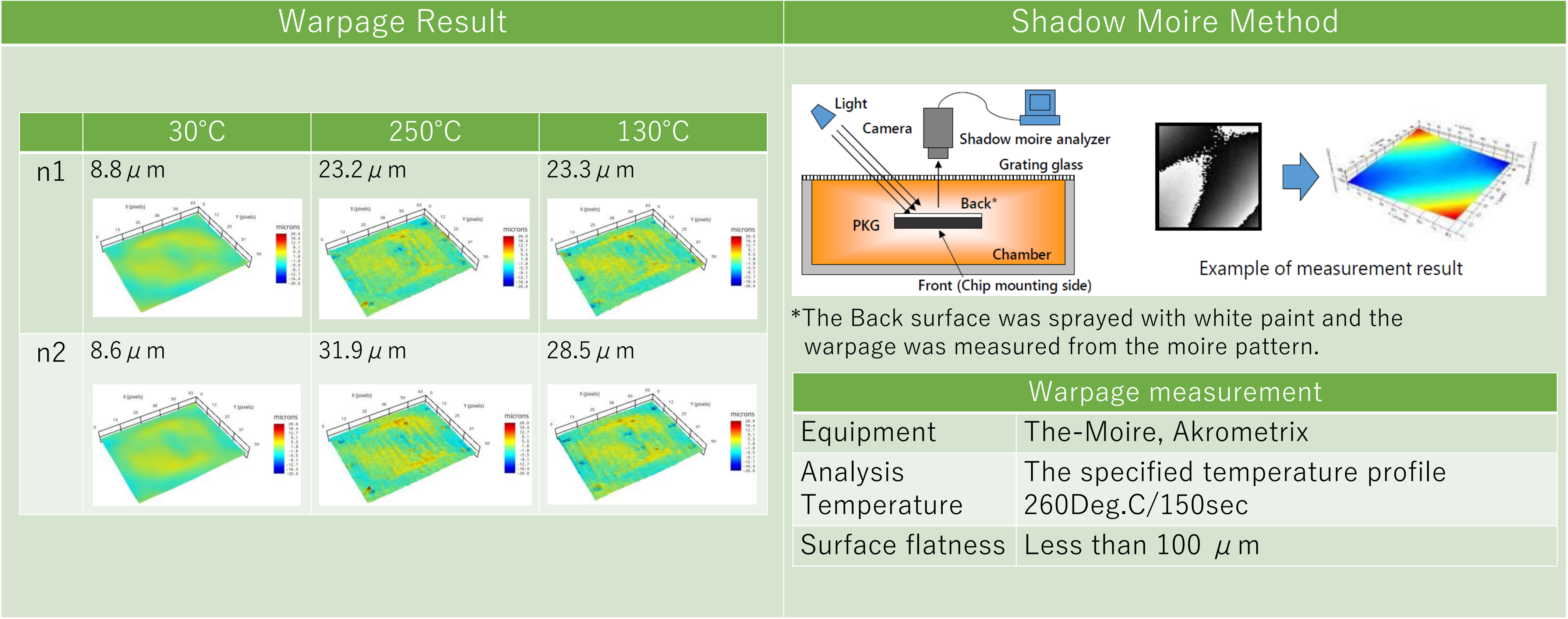
Items		Unit	Build Up Material		Structure
			ABF	PP	
Tg(DMA)		°C	147	267	
CTE	α 1	ppm/°C	33.8	16.1	
	α 2	ppm/°C	131.2	2.5	
Youngs Modulus		GPa	0.1	12.4	
Dielectric Constant		1 GHz	3.2	3.3	
Dielectric Loss Tangent		1 GHz	0.018	0.002	

Dimensional stability

Items	Unit	Spec	Result
Probe Pad Location	μm	<10	<6
Probe Pad Diameter	μm	Φ100±5	Φ100±2
Probe Pad Height	μm	<30	<20
LGA Land Location	μm	<50	<30
Flatness	μm	50	40

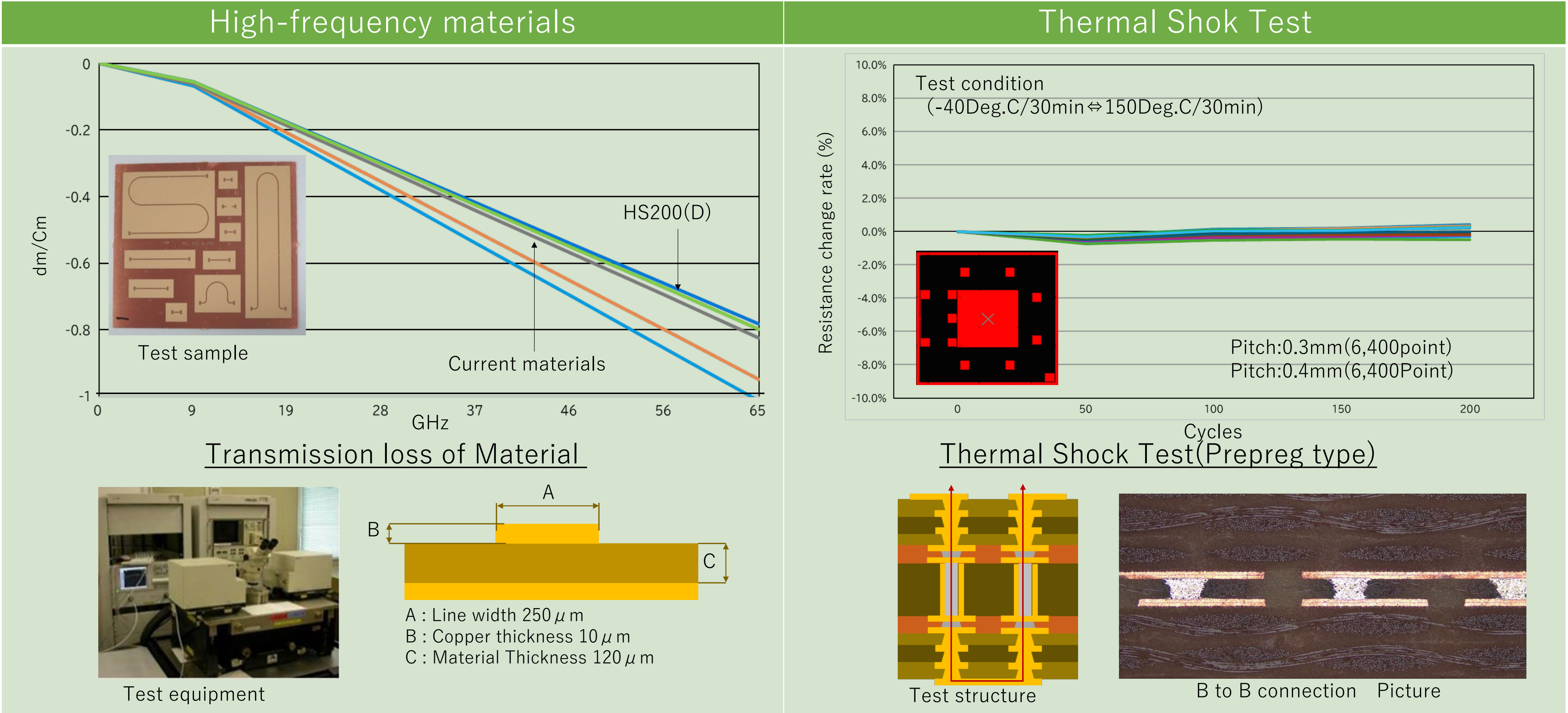
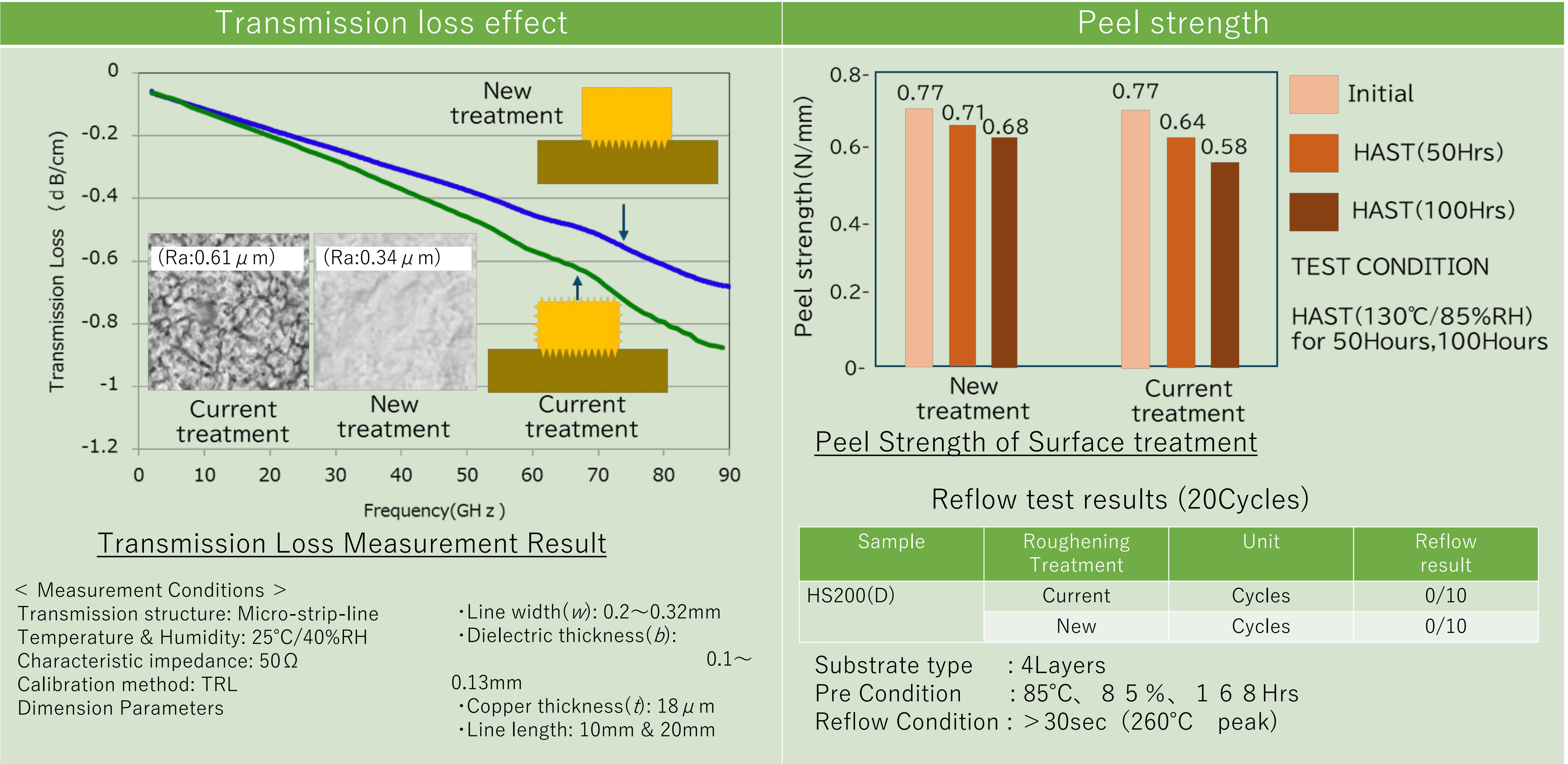


Surface flatness



Characteristics

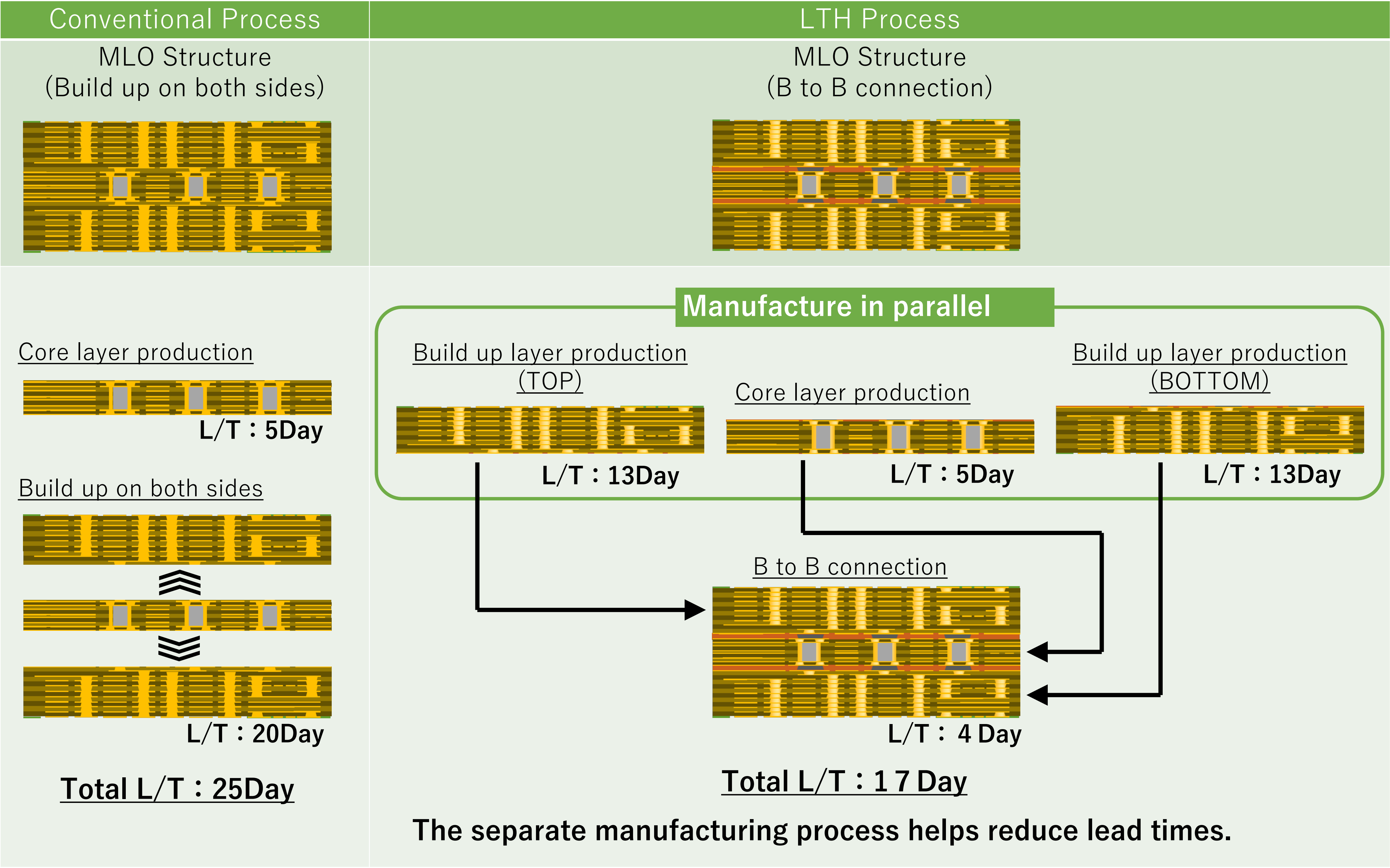
The use of low-Dk materials, low-roughness copper foil, and optimized surface treatment provides high reliability towards reduced transmission loss, controlled skin effect, and stable peel strength.



Reducing manufacturing lead times

*60Layer Structure

Manufacturing lead time is reduced by fabricating 3 divided substrates in parallel and bonding them together using B to B connection.



Results

This structure enables fine-pitch compatibility and electrode positional accuracy due to the exceptional dimensional stability and flatness.

In addition, it reduces adhesion and reliability risks in dissimilar material lamination, contributing to lower cost and shorter lead times for MLO substrates.

Conclusion

For semiconductor inspection space transformers with increasingly fine pitch requirements, an MLO substrate using low-Dk FR-5 equivalent material and glass cloth insulating layers achieves both fine-pitch capability and dimensional stability while enabling lower cost and shorter lead times.

Our future work will focus on higher layer counts and narrower pitch.

Items	Unit	2026	2027	2028
Max. Layer structure	-	56L	60L	66L
Min. C4 Pad Pitch	μ m	100	80	70
Line/Space	μ m	15/30	1 5 /20	15/15
Laser via land diameter	μ m	Φ 60	Φ 40	Φ 30
Laser Via Diameter	μ m	Φ 35	Φ 25	Φ 20

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