



# Fine Pitch Probocard

## 40 $\mu$ m pitch

## FURTHER CHALLENGES IN EPOXY CANTILEVER TECHNOLOGY

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# Fine Pitch Probing

**What criteria must be evaluated and what approach must be taken to accomplish this objective.**

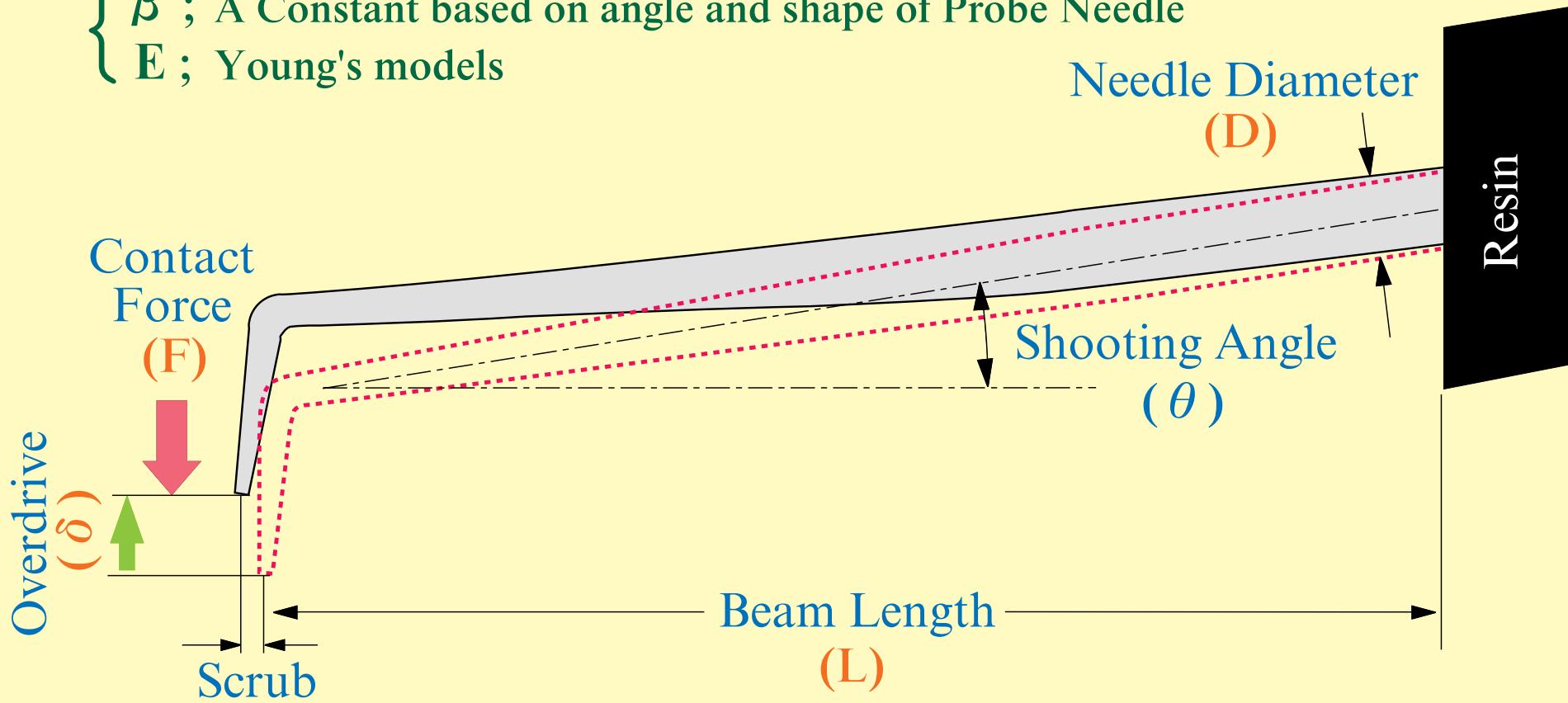
- 1. Find the most suitable design for needles**
  - (1) Think about the structure of needle spider**
  - (2) Determine a design physically**
  - (3) Based on engineering material analysis**
- 2. Improve the process technology and assembly technology**
- 3. Confirm the ability of the touchdowns by inspection**

# The Elements of Epoxy Cantilever Technology

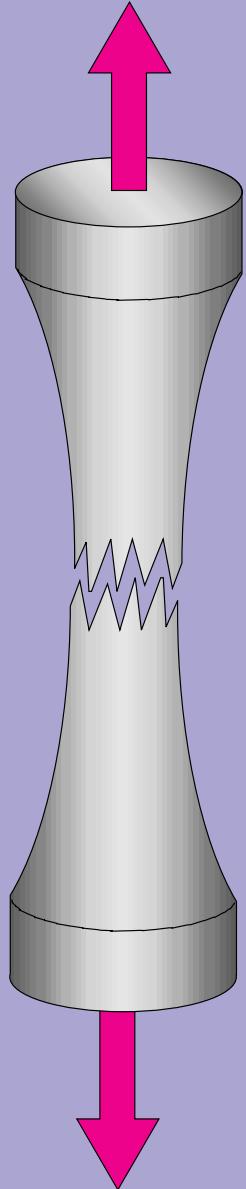
$$F \doteq \frac{3\pi\beta D^4 E \delta}{64L^3}$$

(g) ..... over drive and contact force is in proportion to the probe needles shape and a constant angle

{  $\beta$  ; A Constant based on angle and shape of Probe Needle  
{ E ; Young's models



# Tension Test

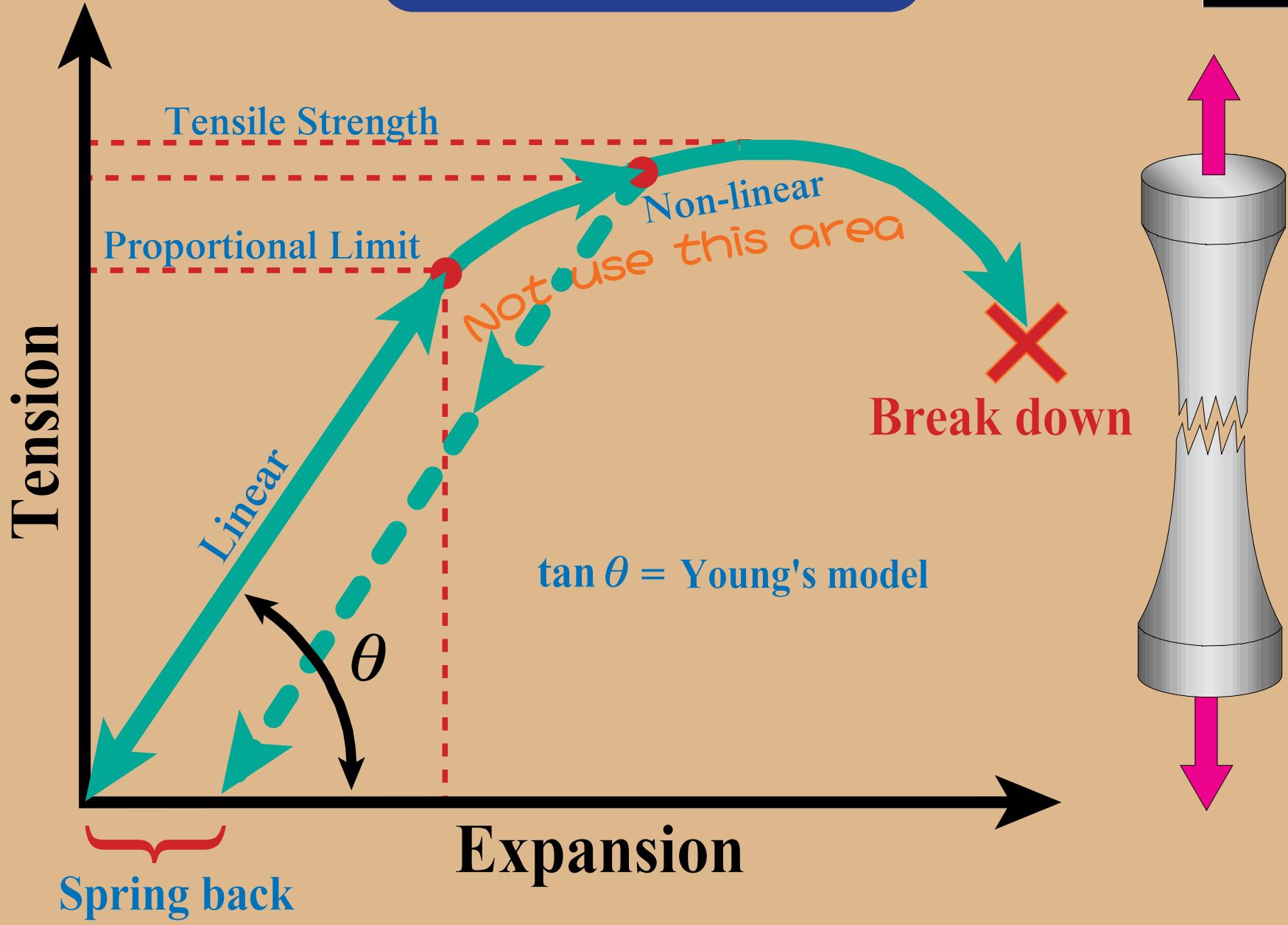


**What we can find by tension test  
of Probe Needle**

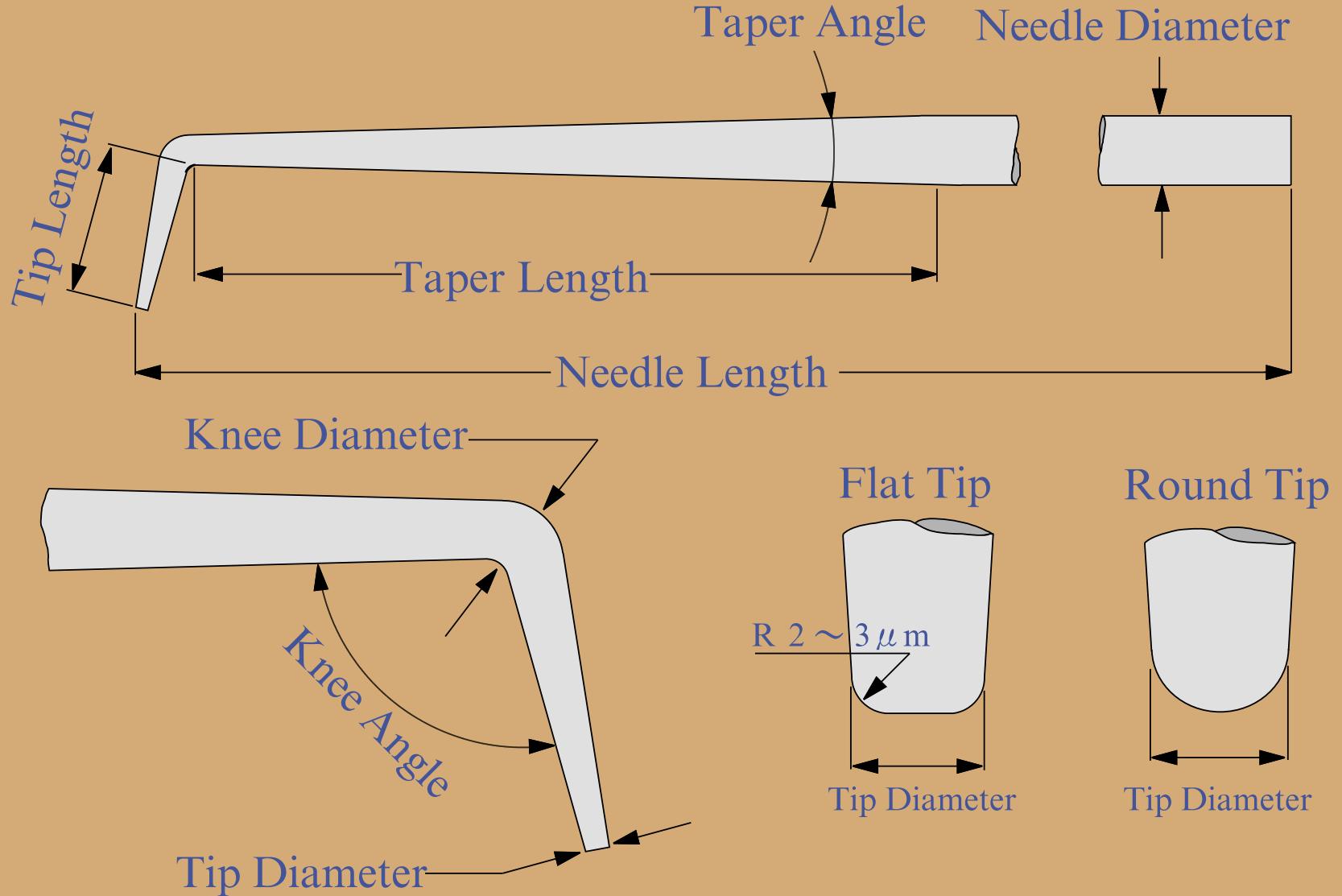
1. Tensile strength
2. Young's models
3. Proportional limit

**Considering the result of F.E.M.  
analysis for needle shape, we can  
determine the limitation of the  
over drive amount that the probes  
can withstand.**

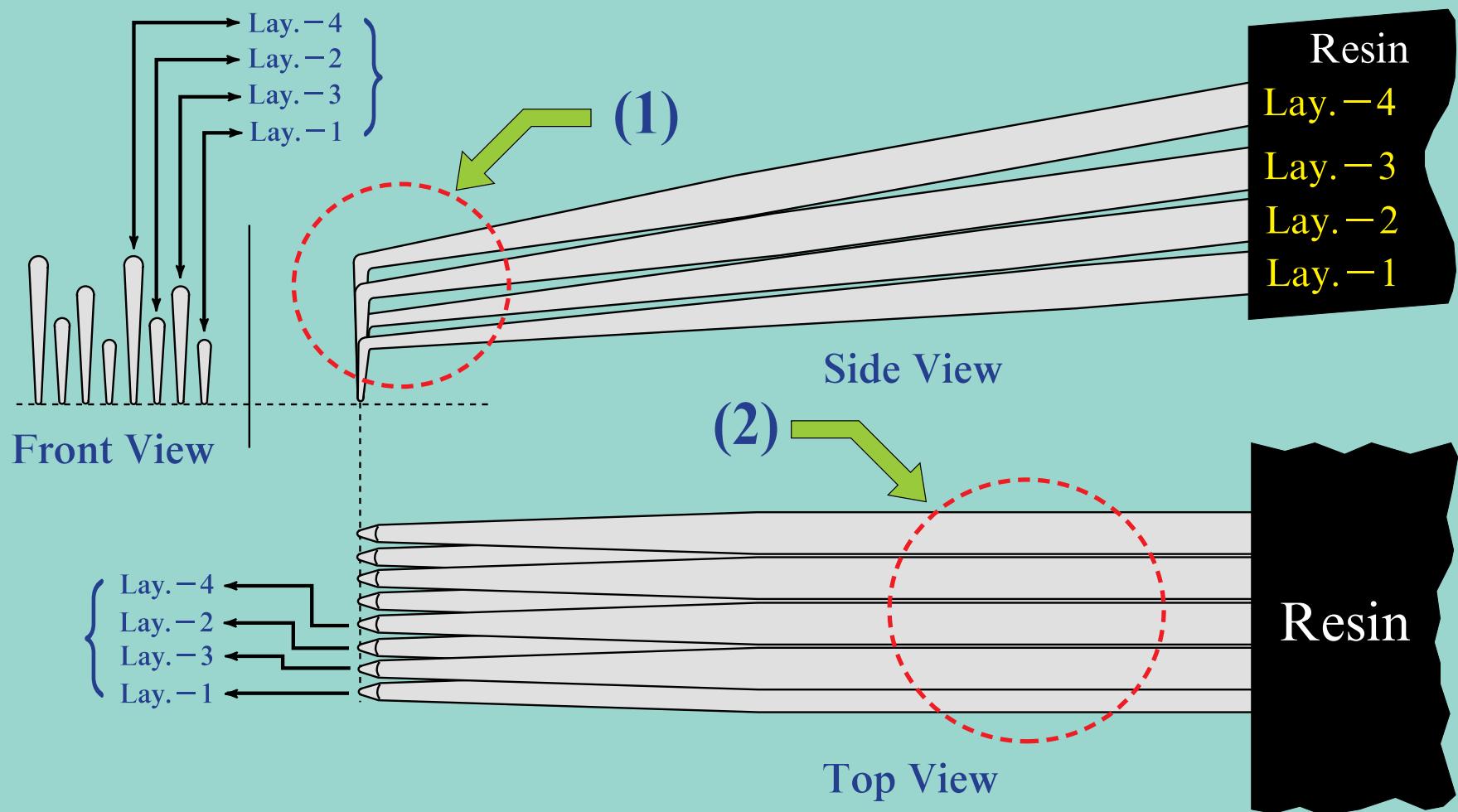
# Tension Test



# Dimensions of probe needle design

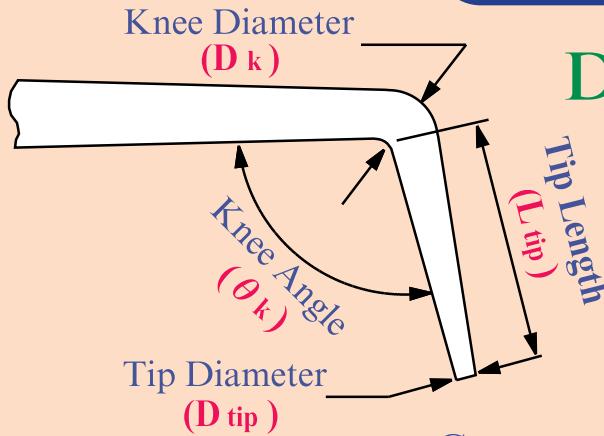


# 4 Layer structure of probe needles

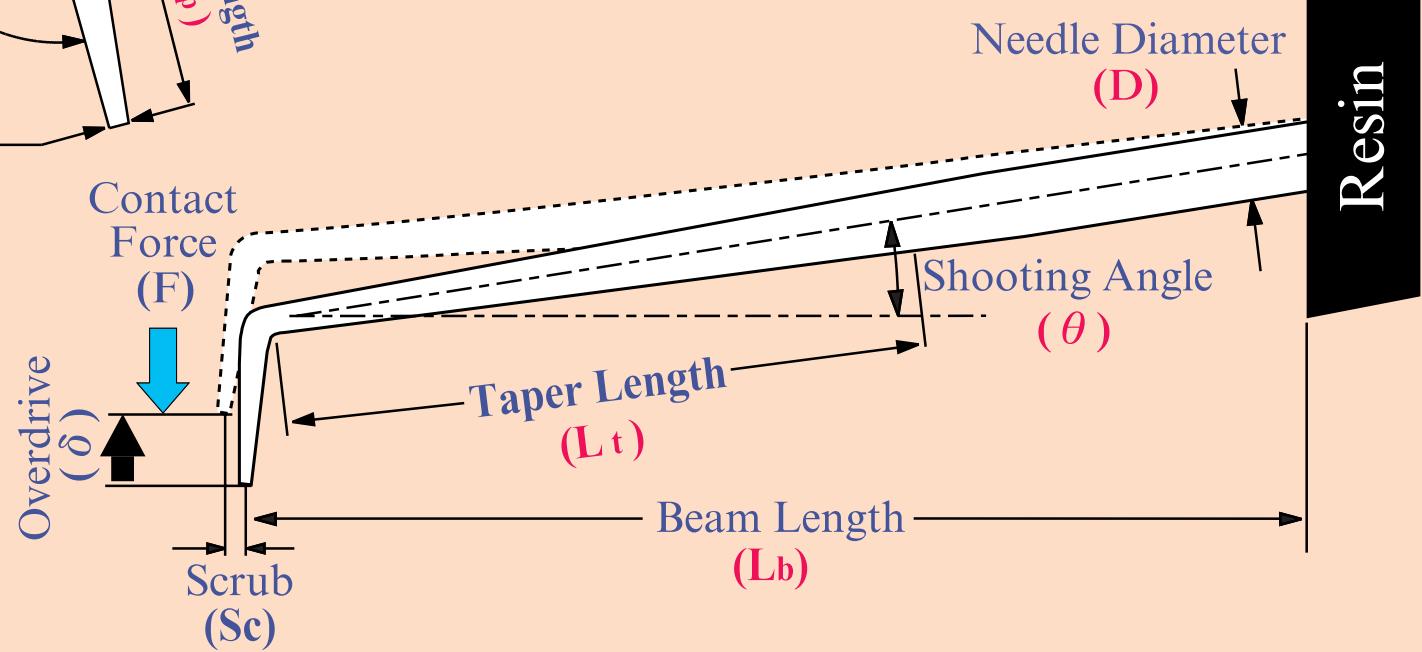


1. Difference of Tip Length in each layer to avoid touching with the next needles.
2. Parallel arrangement of Probe Needles can remove limitation in numbers of needles to be arranged.

# Needle Shape



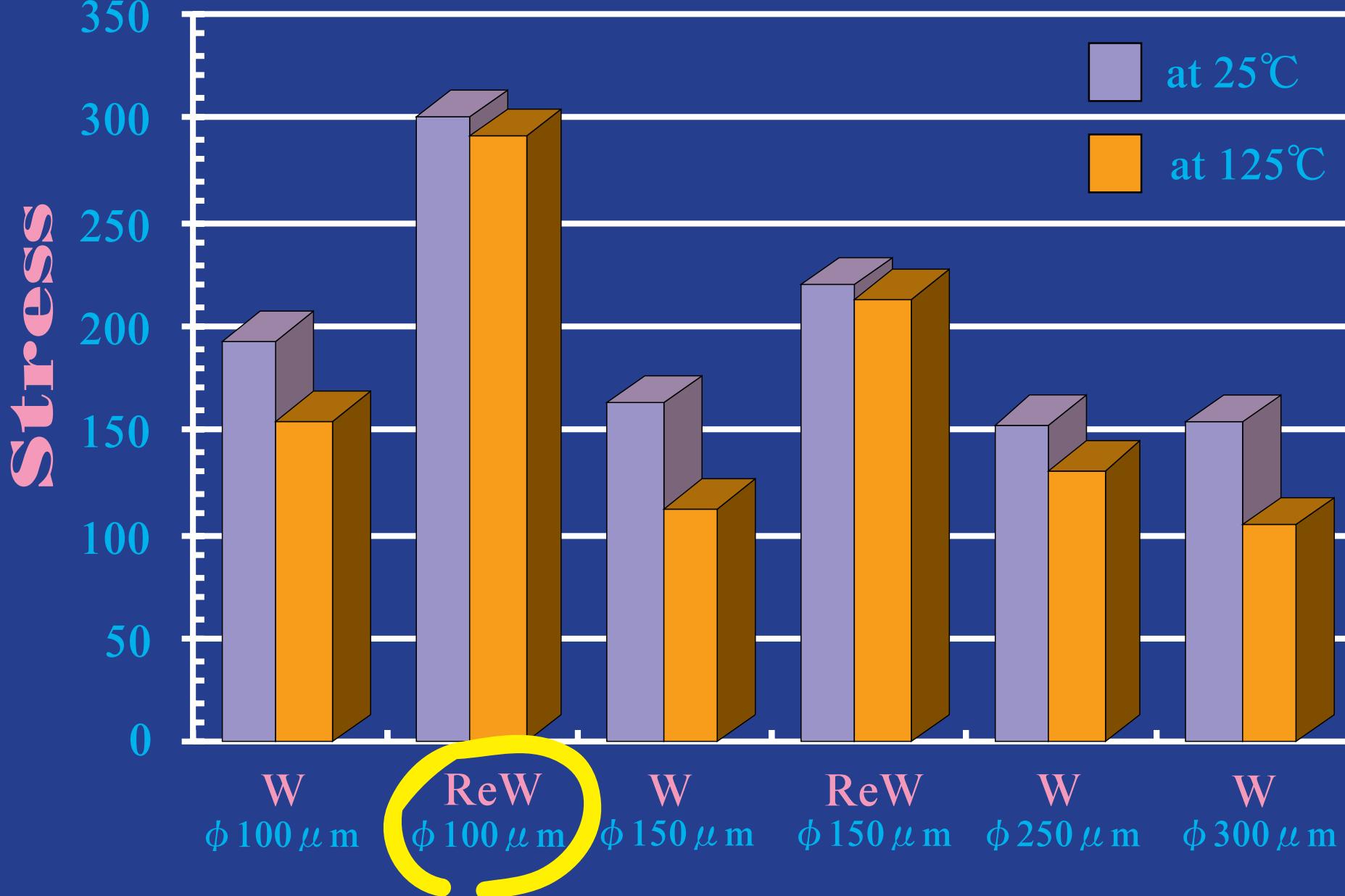
## Design of Probe Needles to achieve $40 \mu m$ pitch



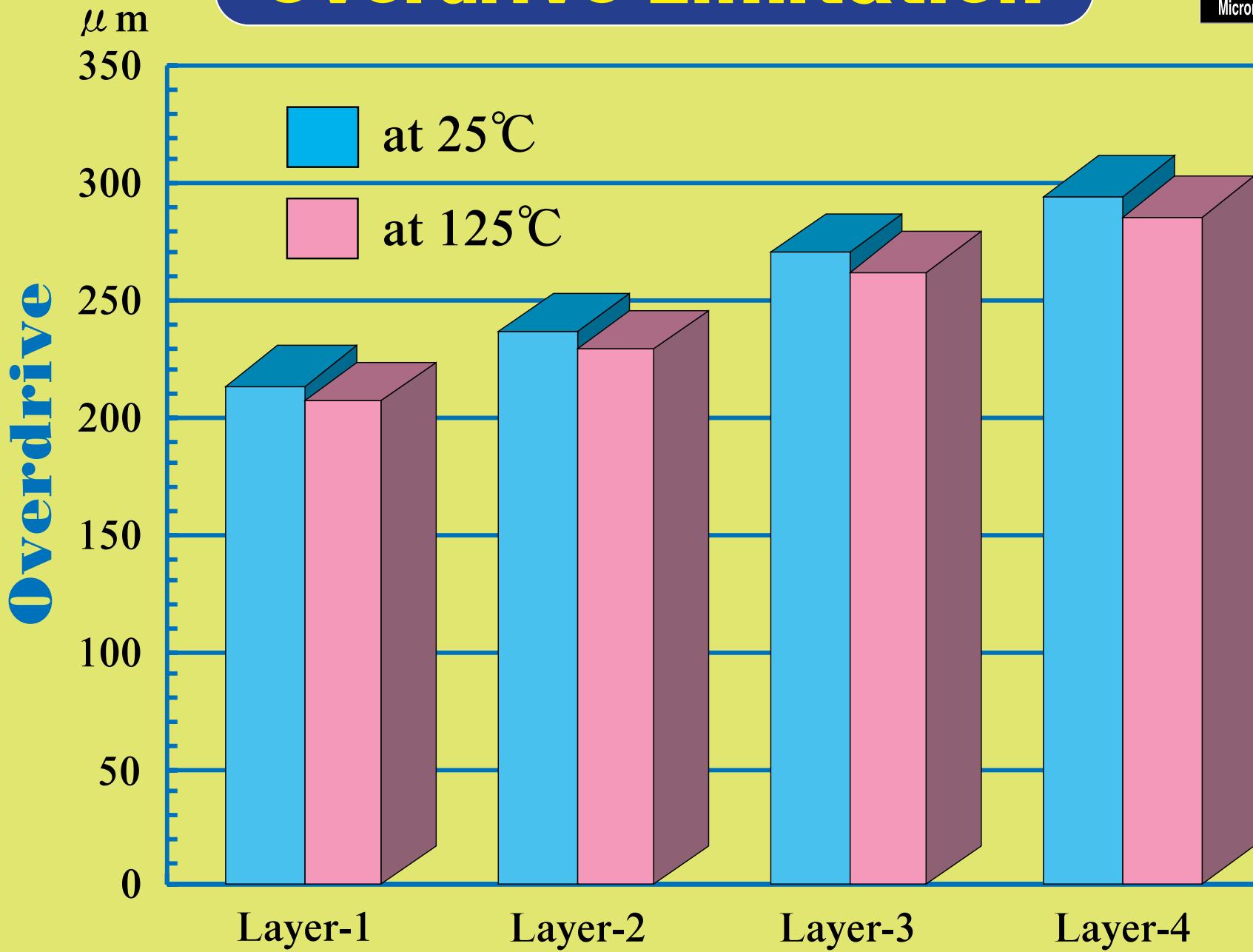
Layer	$D$ $\mu m$	$L_t$ mm	$L_{tip}$ $\mu m$	$D_k$ $\mu m$	$\theta_k$ Deg.	$D_{tip}$ $\mu m$	$L_b$ mm	$\theta$ Deg.
1	100	1.2	170	30	103	10~15	2.0	5
2	100	1.2	230	33	106	10~15	2.0	7
3	100	1.2	290	37	109	10~15	2.0	10
4	100	1.2	350	40	112	10~15	2.0	12

Kgf / mm<sup>2</sup>

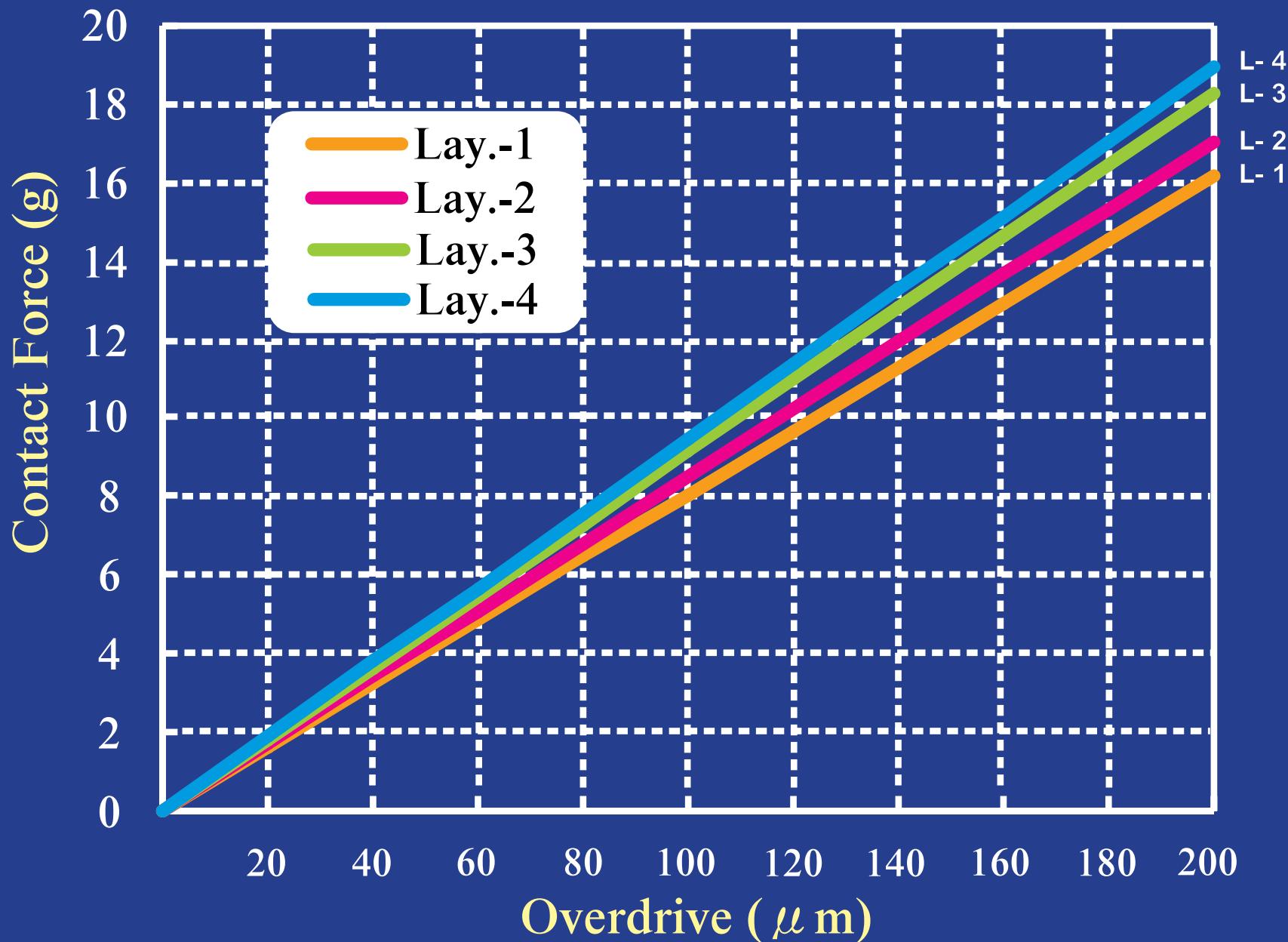
# Proportional Limit



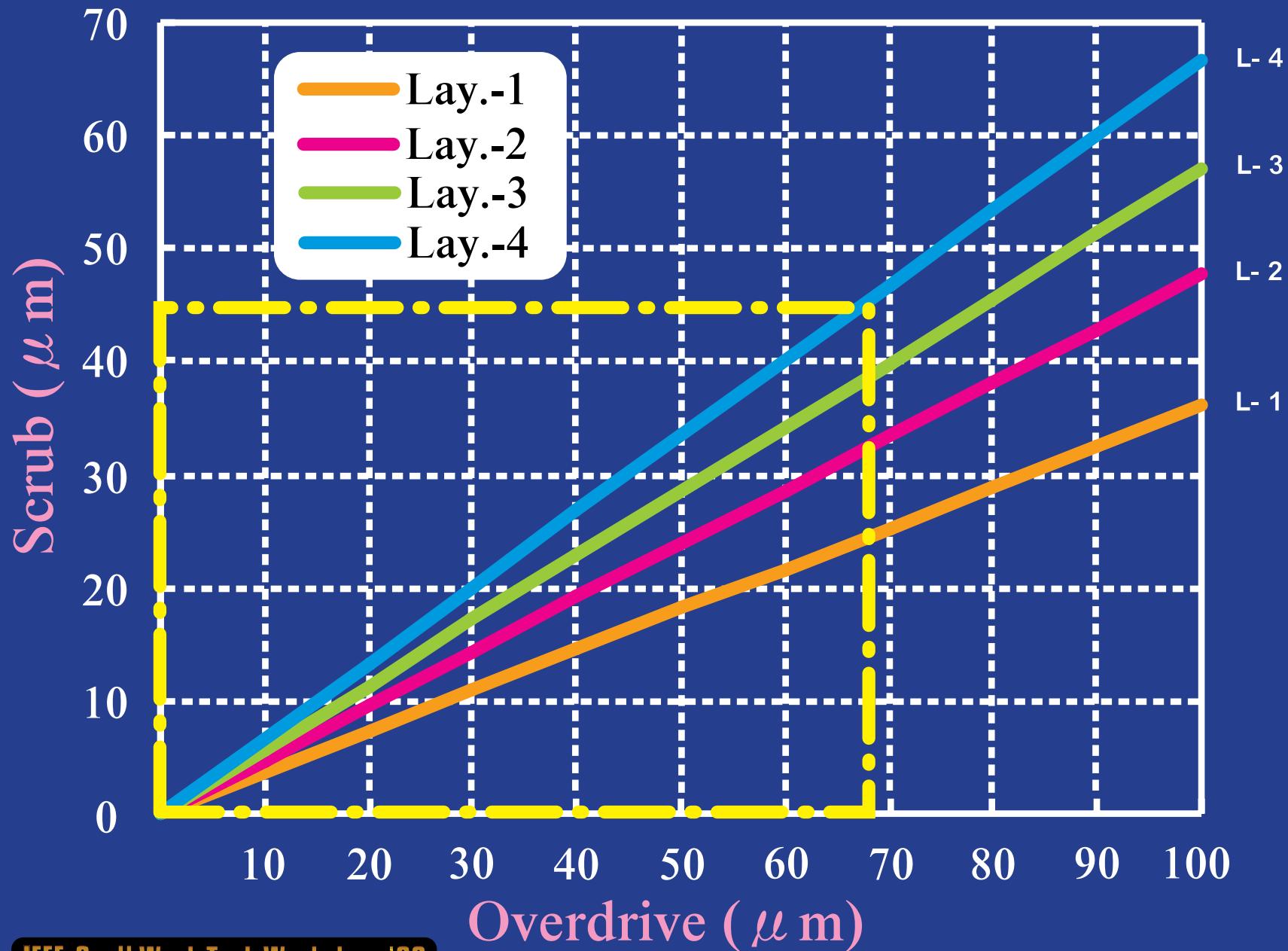
# Overdrive Limitation



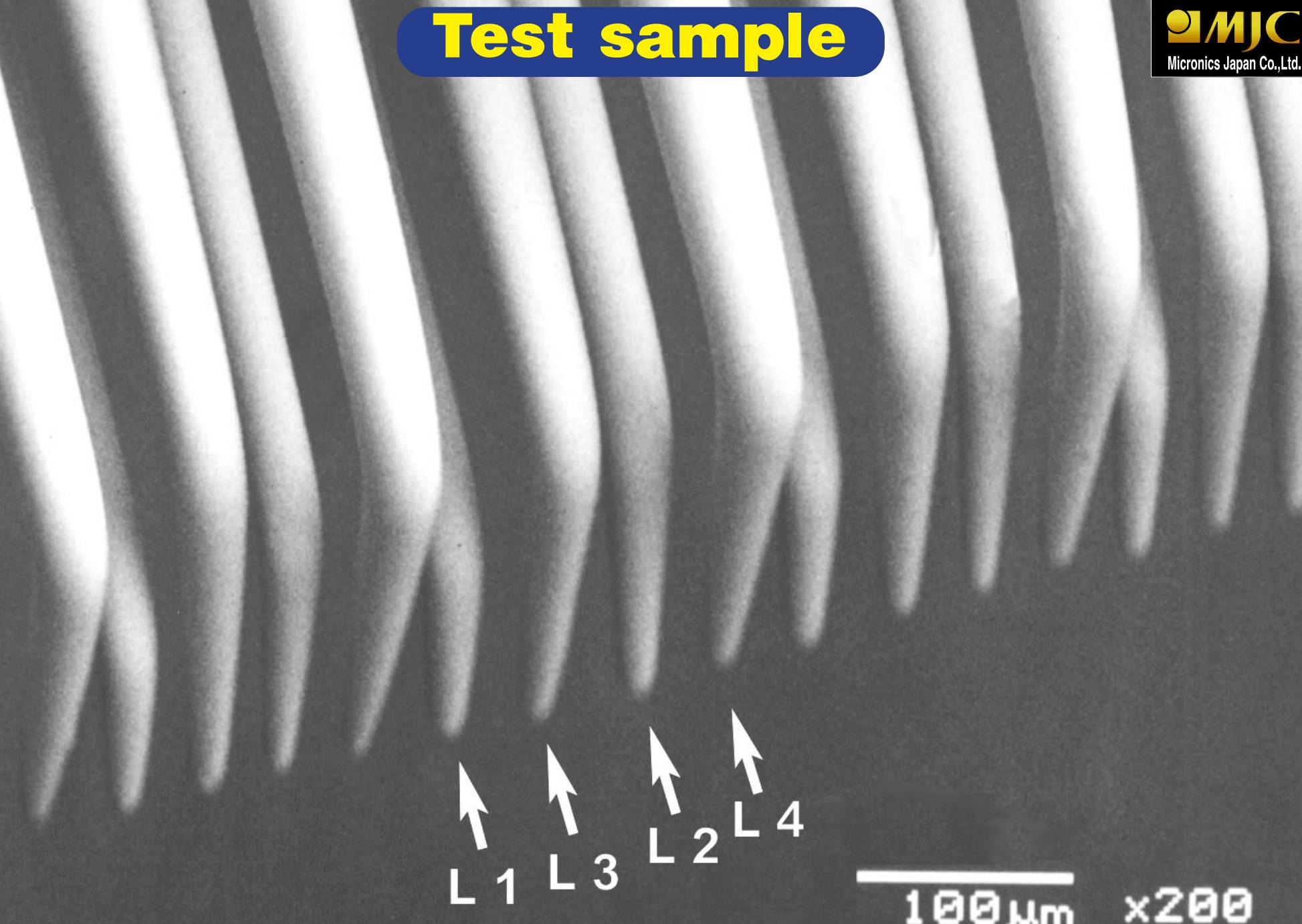
# Contact Force



# Overdrive Limitation



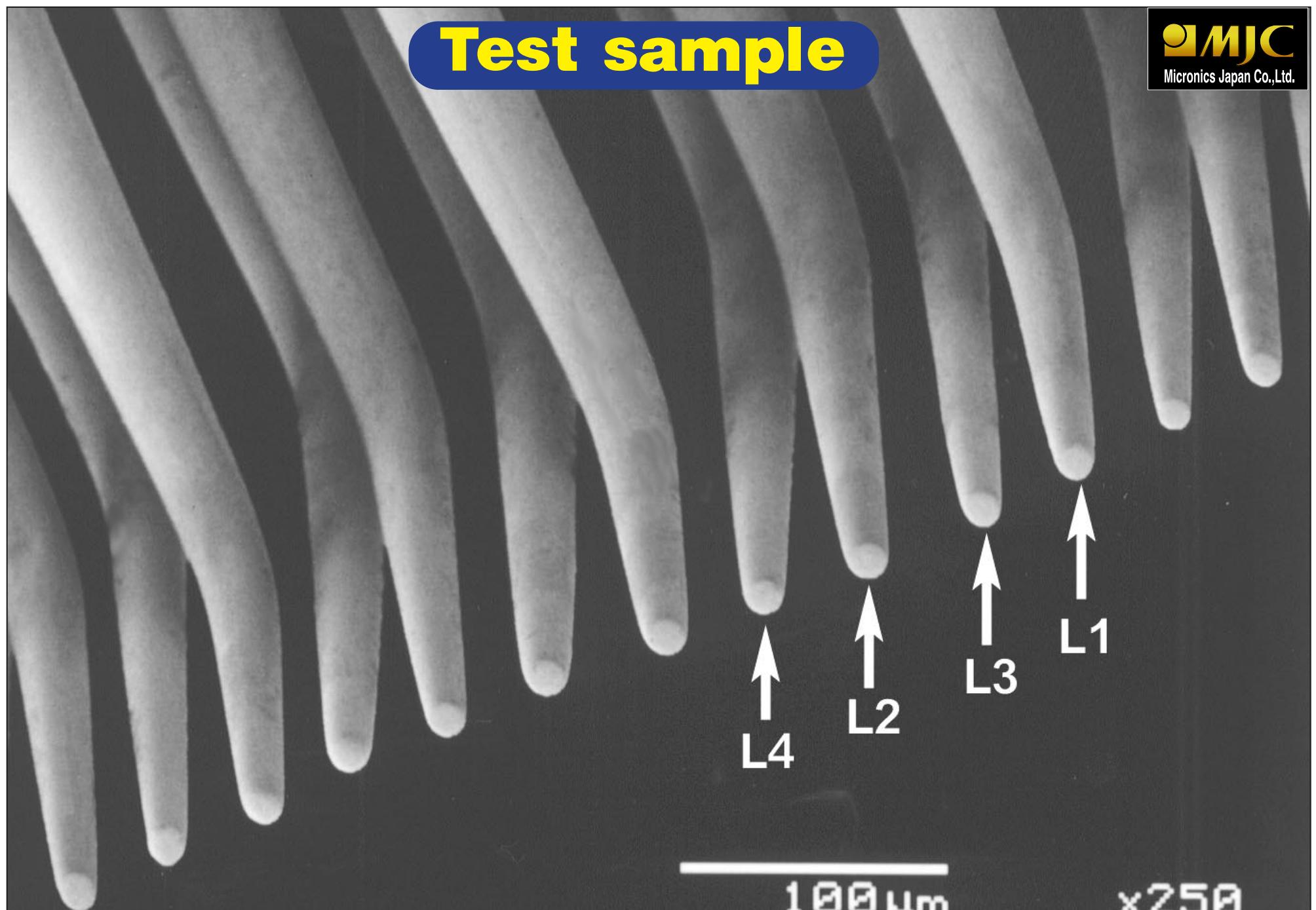
# Test sample



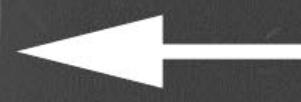
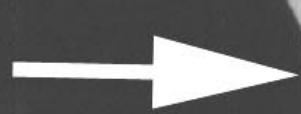
L 1 L 3 L 2 L 4

100  $\mu\text{m}$   $\times 200$

# Test sample



# Test sample



$\phi 15 \mu\text{m}$

10  $\mu\text{m}$

$\times 1,000$