

Change of Terminal Plating of NEC/TOKIN Chip Ta Capacitor

- Introduction of Lead-free Products -

September 2002
NEC Electronics (Europe) GmbH

Contents

1. Definition of change

- Description of change
- Reason of change
- Schedule and Identification
- Solderability and Reliability
- Conclusion

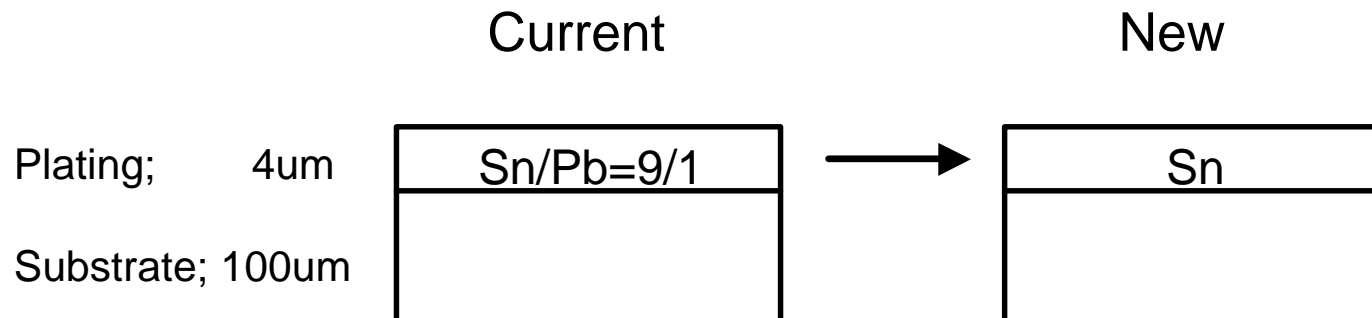
2. Supplement

- Solderability and Joint Strength Comparison
- Recommended Reflow Profile

Description of Change

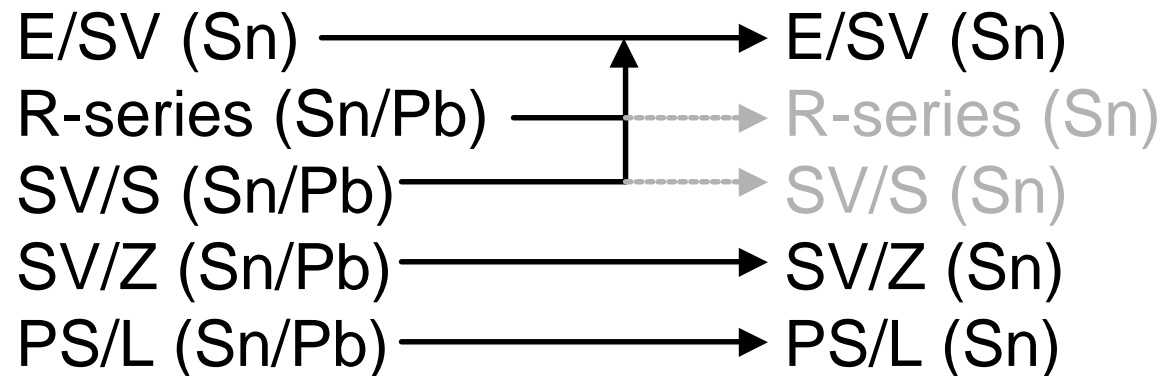
What will be changed?

- The plating of terminal will be changed from **Sn/Pb plating** to **Sn plating (Lead-free)**.



- No change for electrical design
- No change for manufacturing process
- No change for manufacturing facility/site

What product?



- R and SV/S series will be changed to E/SV series.
- SV/Z and PS/L series will not change, but terminal plating will be changed to Sn.

Reason of Change

Why?

In order to meet growing demand for environmental-consciousness, NEC would like eliminate Pb from terminal plating.

NEC believe this will contribute customers to develop Pb-free products, which will be welcome in near future.

Schedule & Identification of Change

Schedule

- from January 2003 production-lots

Identification of R, SV/Z, SV/S and PS/L series

- Lot. number (6 - 9 digits) can identify Lead-free or not.
- From appearance, it is very difficult to identify whether Lead-free or not.

Solderability and Reliability

How about solderability and joint strength of Lead-free terminal capacitors?

- Same as conventional Sn/Pb plating capacitors (Please see supplement).

Reliability of electrical characteristics?

- Same reliability as conventional Sn/Pb plating parts (Please see CMG-E-32436)

Conclusions

NEC believes that Lead-free terminal capacitor have the same characteristics as conventional capacitor. And it has the same mechanical strength and electrical reliability.

So, we highly appreciate understanding on our Lead-free terminal introduction from January 2003.

For further questions, please contact us.

Supplement 1

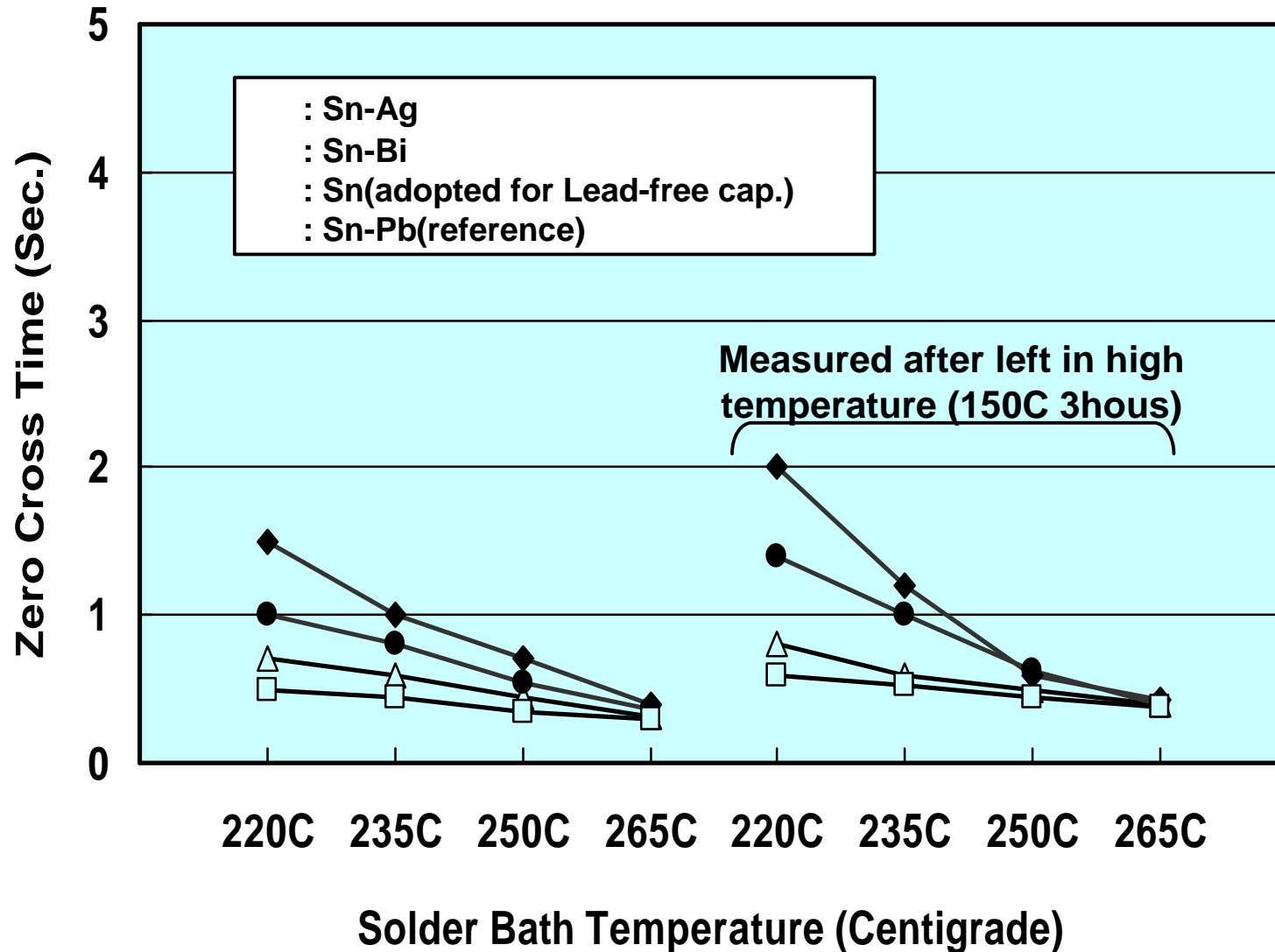
- Solderability and Joint Strength Comparison -

1. Objectives

- Confirmation of solder wetting rate
- Confirmation of joint reliability

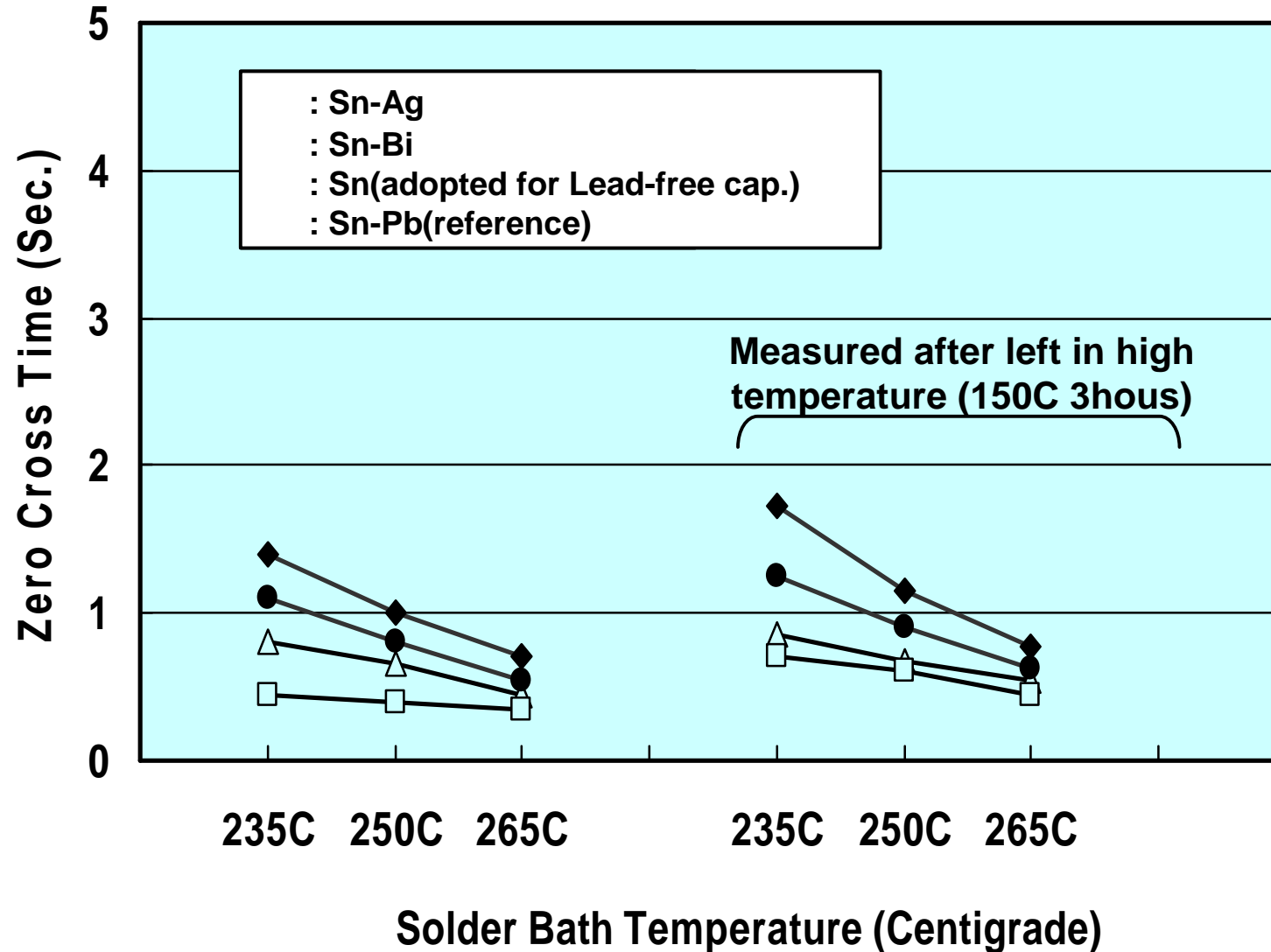
2-1. Solder Wetting Rate

-SnPb eutectic solder bath-



2-2. Solder Wetting Rate

-SnAuCu solder bath-



3. Joint Strength Evaluation Conditions

Evaluated Parts

- SVSP0J106M: Sn/Pb (90%/10%) Terminal Plating
- ESVP0J106M: Sn (100%) Terminal Plating

4. Mounting / Evaluation Conditions

Mounting Conditions

- 1) Air reflow only
- 2) Air reflow to Air reflow
- 3) Air reflow to Air flow (solder bath temperature: 250C)
- 4) Air reflow to Air flow (solder bath temperature: 270C)

Equipment and Set-up Conditions

Reflow Equipment: REF-1 (by Panasonic)

- Please refer to the following pages for the temperature profile.

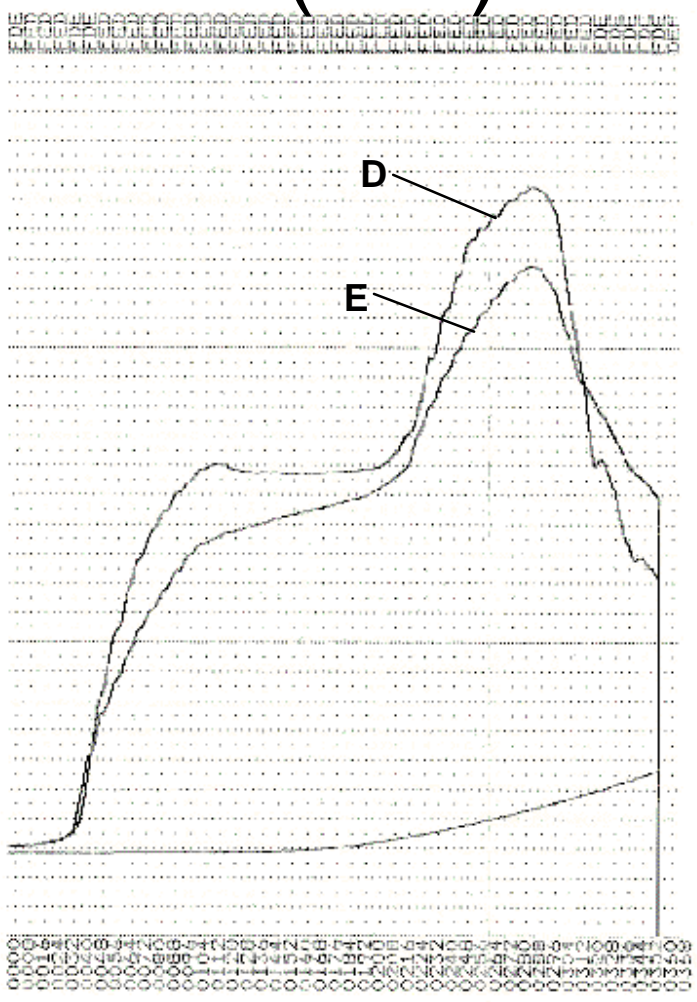
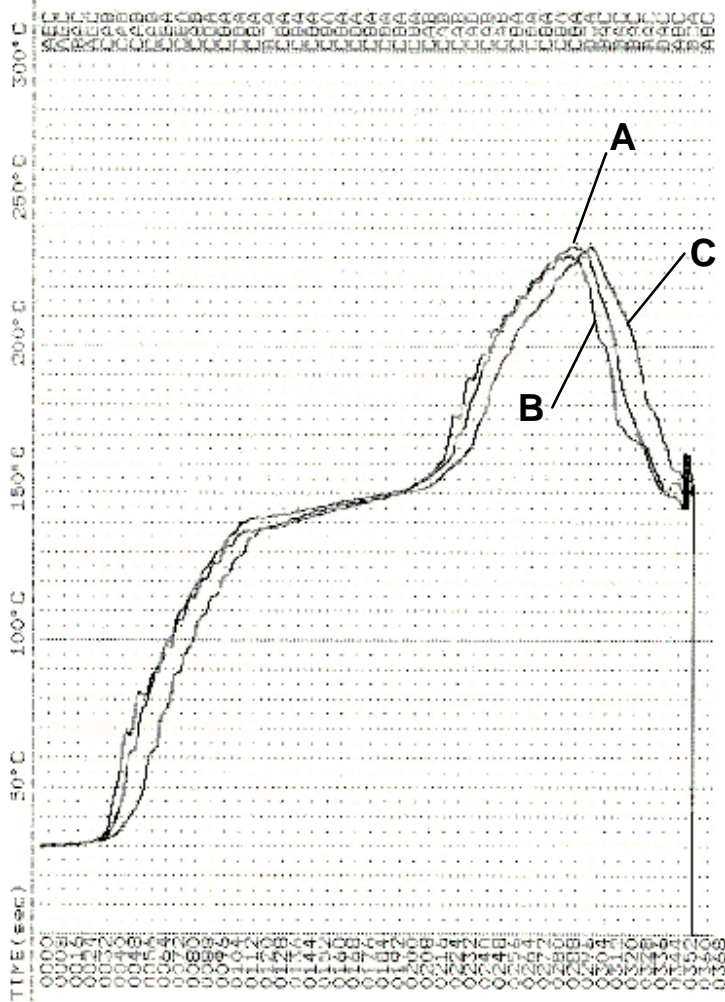
Flow Equipment: SND-300N2 (by Senju Metal Industry, at NEC Shizuoka)

- Pre-heat temperature: 280C (100C on the bottom side of PWB)
- Solder bath temperature: 250C / 270C
- Conveyer speed: 1m/min.
- Please refer to the following pages for the temperature profile.

Temperature Conditions after Mounting

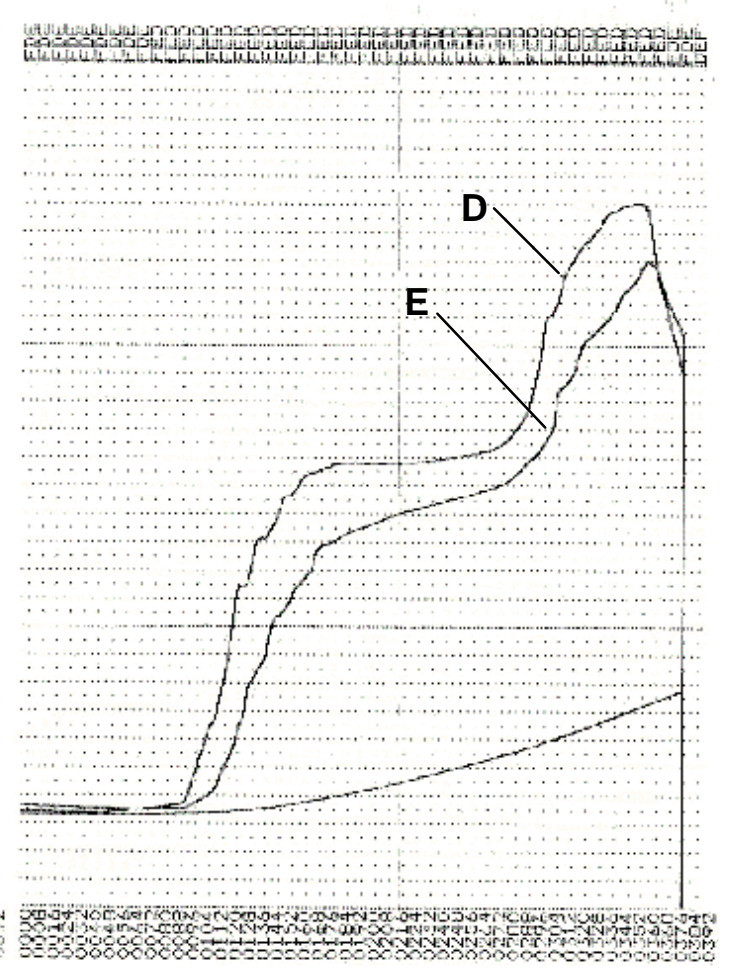
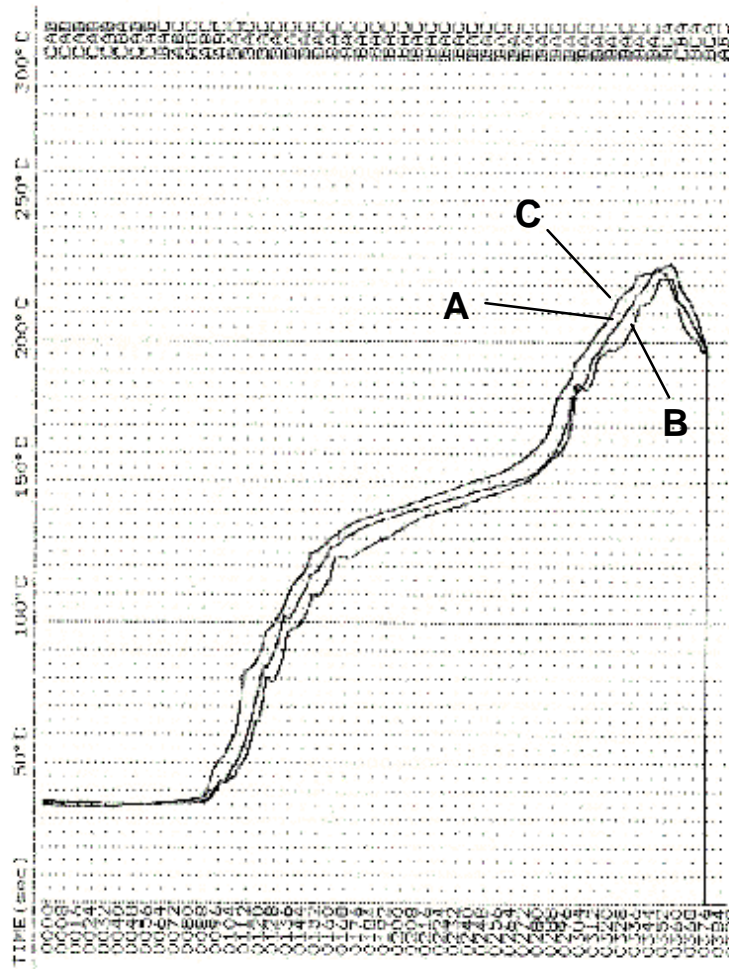
- Temperature cycle (-40C to +125C, 500 cycles)
- High temperature (+125C, 500 hours)

Reflow Profile (first)



Time	Temp	Delta	Rate
00:00:00	25.00	0.00	0.00
00:00:01	25.00	0.00	0.00
00:00:02	25.00	0.00	0.00
00:00:03	25.00	0.00	0.00
00:00:04	25.00	0.00	0.00
00:00:05	25.00	0.00	0.00
00:00:06	25.00	0.00	0.00
00:00:07	25.00	0.00	0.00
00:00:08	25.00	0.00	0.00
00:00:09	25.00	0.00	0.00
00:00:10	25.00	0.00	0.00
00:00:11	25.00	0.00	0.00
00:00:12	25.00	0.00	0.00
00:00:13	25.00	0.00	0.00
00:00:14	25.00	0.00	0.00
00:00:15	25.00	0.00	0.00
00:00:16	25.00	0.00	0.00
00:00:17	25.00	0.00	0.00
00:00:18	25.00	0.00	0.00
00:00:19	25.00	0.00	0.00
00:00:20	25.00	0.00	0.00
00:00:21	25.00	0.00	0.00
00:00:22	25.00	0.00	0.00
00:00:23	25.00	0.00	0.00
00:00:24	25.00	0.00	0.00
00:00:25	25.00	0.00	0.00
00:00:26	25.00	0.00	0.00
00:00:27	25.00	0.00	0.00
00:00:28	25.00	0.00	0.00
00:00:29	25.00	0.00	0.00
00:00:30	25.00	0.00	0.00
00:00:31	25.00	0.00	0.00
00:00:32	25.00	0.00	0.00
00:00:33	25.00	0.00	0.00
00:00:34	25.00	0.00	0.00
00:00:35	25.00	0.00	0.00
00:00:36	25.00	0.00	0.00
00:00:37	25.00	0.00	0.00
00:00:38	25.00	0.00	0.00
00:00:39	25.00	0.00	0.00
00:00:40	25.00	0.00	0.00
00:00:41	25.00	0.00	0.00
00:00:42	25.00	0.00	0.00
00:00:43	25.00	0.00	0.00
00:00:44	25.00	0.00	0.00
00:00:45	25.00	0.00	0.00
00:00:46	25.00	0.00	0.00
00:00:47	25.00	0.00	0.00
00:00:48	25.00	0.00	0.00
00:00:49	25.00	0.00	0.00
00:00:50	25.00	0.00	0.00
00:00:51	25.00	0.00	0.00
00:00:52	25.00	0.00	0.00
00:00:53	25.00	0.00	0.00
00:00:54	25.00	0.00	0.00
00:00:55	25.00	0.00	0.00
00:00:56	25.00	0.00	0.00
00:00:57	25.00	0.00	0.00
00:00:58	25.00	0.00	0.00
00:00:59	25.00	0.00	0.00
00:01:00	25.00	0.00	0.00
00:01:01	25.00	0.00	0.00
00:01:02	25.00	0.00	0.00
00:01:03	25.00	0.00	0.00
00:01:04	25.00	0.00	0.00
00:01:05	25.00	0.00	0.00
00:01:06	25.00	0.00	0.00
00:01:07	25.00	0.00	0.00
00:01:08	25.00	0.00	0.00
00:01:09	25.00	0.00	0.00
00:01:10	25.00	0.00	0.00
00:01:11	25.00	0.00	0.00
00:01:12	25.00	0.00	0.00
00:01:13	25.00	0.00	0.00
00:01:14	25.00	0.00	0.00
00:01:15	25.00	0.00	0.00
00:01:16	25.00	0.00	0.00
00:01:17	25.00	0.00	0.00
00:01:18	25.00	0.00	0.00
00:01:19	25.00	0.00	0.00
00:01:20	25.00	0.00	0.00
00:01:21	25.00	0.00	0.00
00:01:22	25.00	0.00	0.00
00:01:23	25.00	0.00	0.00
00:01:24	25.00	0.00	0.00
00:01:25	25.00	0.00	0.00
00:01:26	25.00	0.00	0.00
00:01:27	25.00	0.00	0.00
00:01:28	25.00	0.00	0.00
00:01:29	25.00	0.00	0.00
00:01:30	25.00	0.00	0.00
00:01:31	25.00	0.00	0.00
00:01:32	25.00	0.00	0.00
00:01:33	25.00	0.00	0.00
00:01:34	25.00	0.00	0.00
00:01:35	25.00	0.00	0.00
00:01:36	25.00	0.00	0.00
00:01:37	25.00	0.00	0.00
00:01:38	25.00	0.00	0.00
00:01:39	25.00	0.00	0.00
00:01:40	25.00	0.00	0.00
00:01:41	25.00	0.00	0.00
00:01:42	25.00	0.00	0.00
00:01:43	25.00	0.00	0.00
00:01:44	25.00	0.00	0.00
00:01:45	25.00	0.00	0.00
00:01:46	25.00	0.00	0.00
00:01:47	25.00	0.00	0.00
00:01:48	25.00	0.00	0.00
00:01:49	25.00	0.00	0.00
00:01:50	25.00	0.00	0.00
00:01:51	25.00	0.00	0.00
00:01:52	25.00	0.00	0.00
00:01:53	25.00	0.00	0.00
00:01:54	25.00	0.00	0.00
00:01:55	25.00	0.00	0.00
00:01:56	25.00	0.00	0.00
00:01:57	25.00	0.00	0.00
00:01:58	25.00	0.00	0.00
00:01:59	25.00	0.00	0.00
00:02:00	25.00	0.00	0.00

Reflow Profile (second)

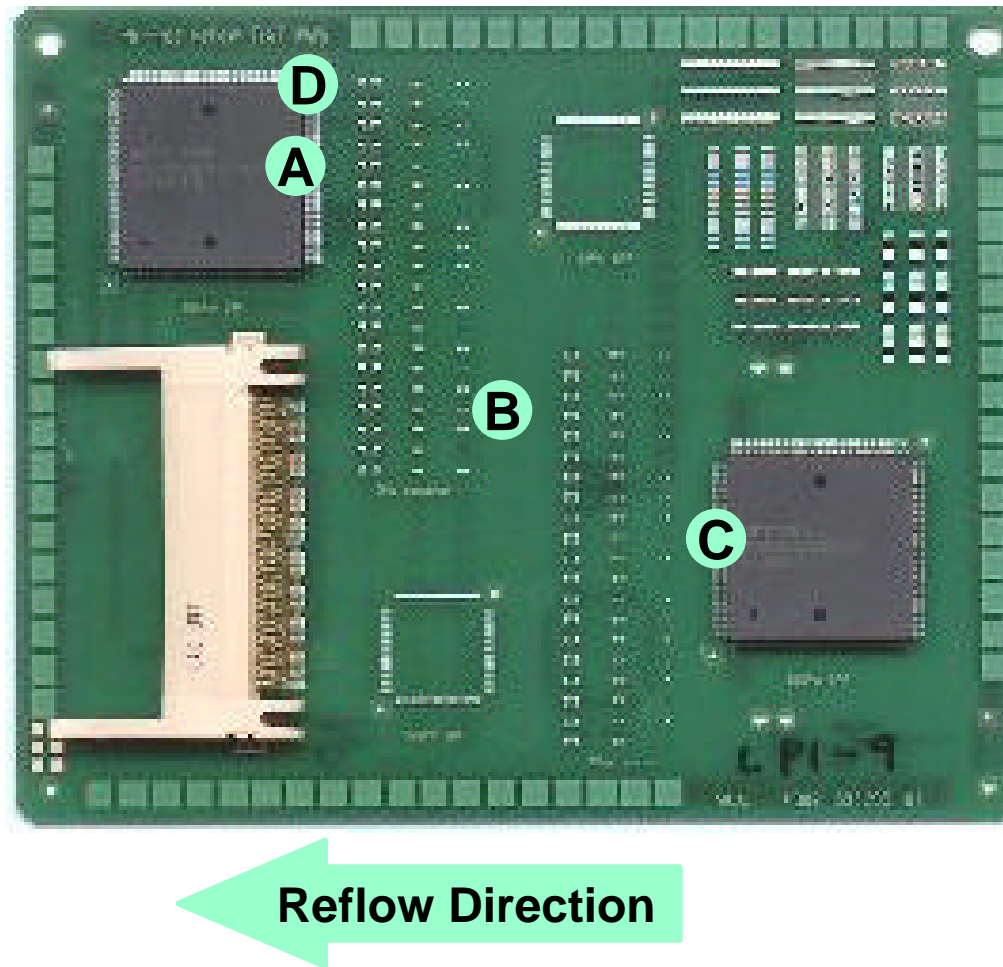


```

PRE-HEAT: 150-180 15SEC
THERMAL EQUILIBRATION: 180-180 300
COOLING: 180-150 15SEC
Dwell Time: 180-180 180
Ramp Up: 180-200 180
Ramp Down: 200-180 180
Peak: 200-180 180
Cooling: 180-150 15SEC

```


Measuring Points of Temperature



5. Joint Strength Test

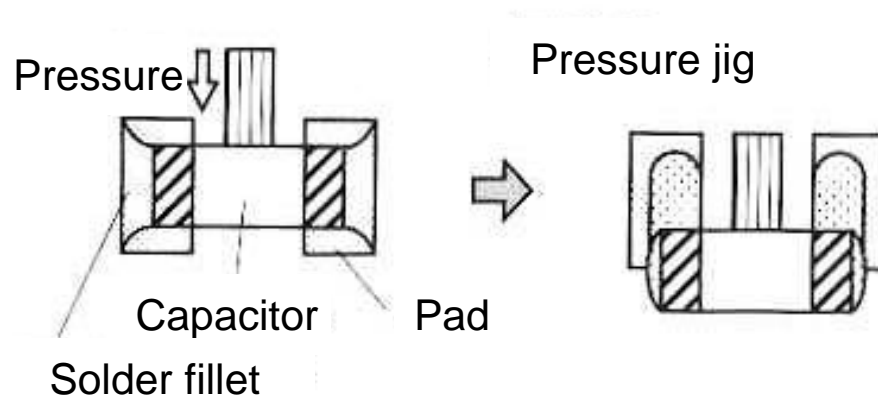
Joint Strength Measurement

- Shearing Test with

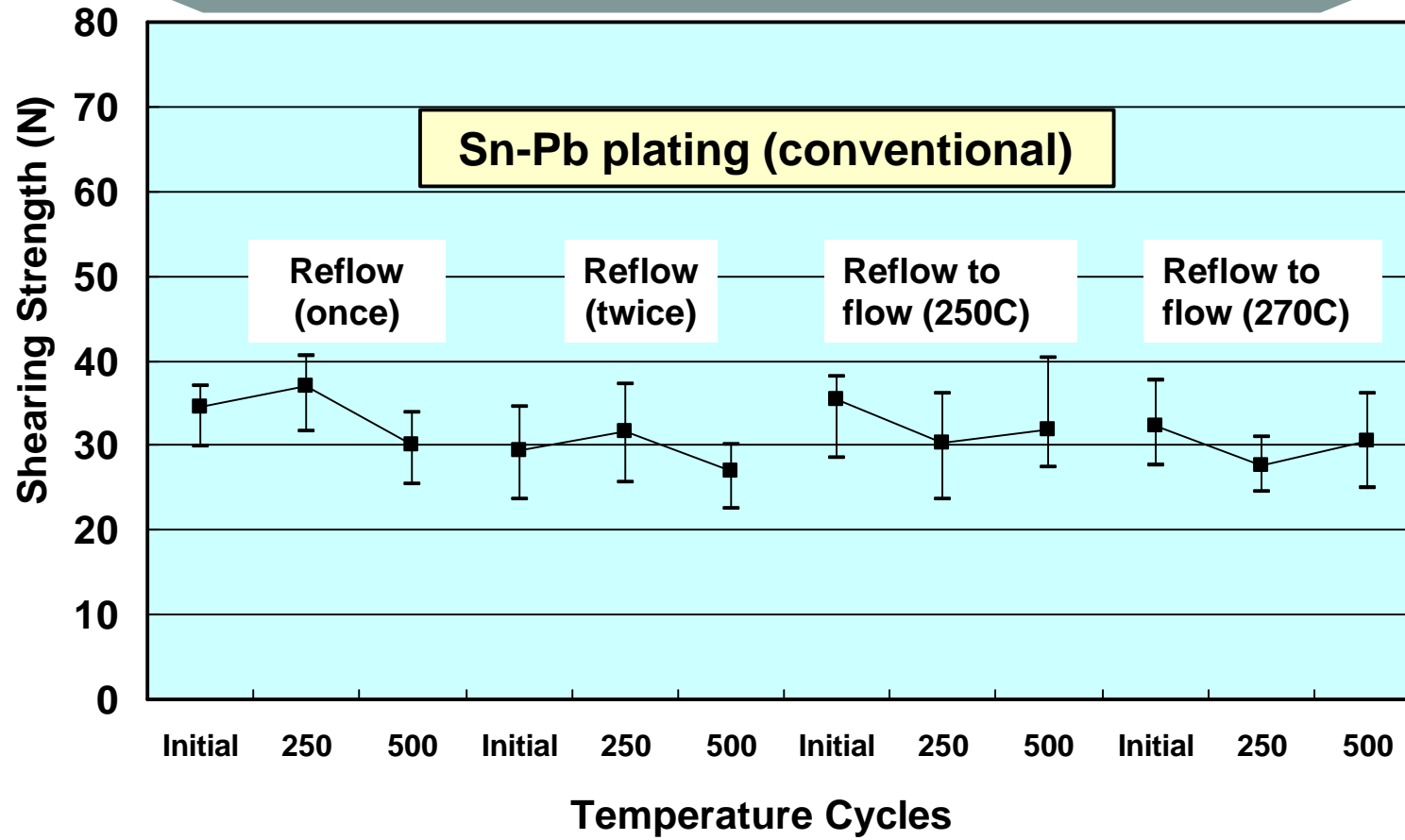
- 1) Temperature cycle: -40C to +125C, 30min., 500 cycle)
- 2) High temperature storage: +125C, 500 hours)

Shearing speed: 10mm/min.

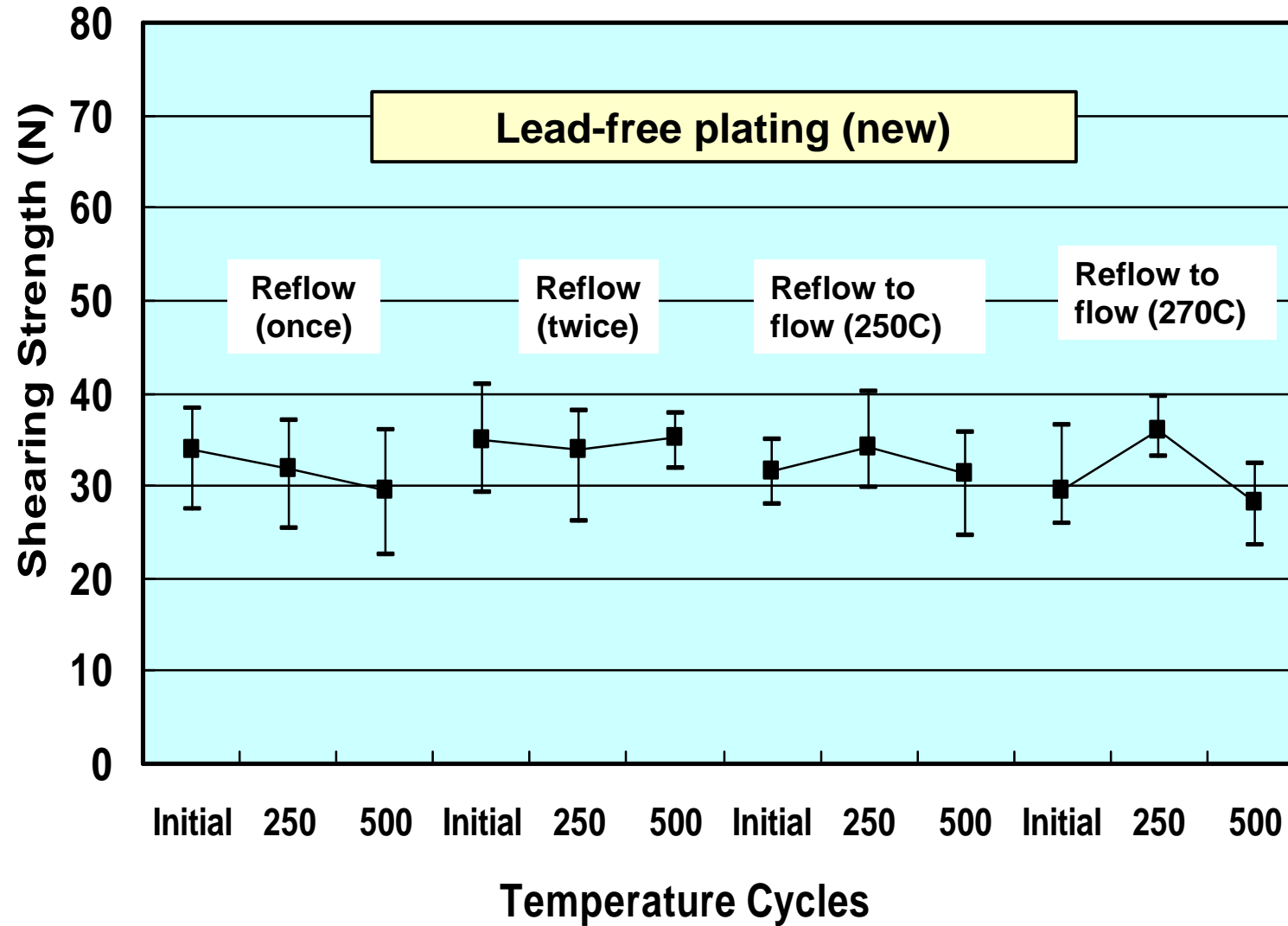
Sample quantity: 11(each condition)



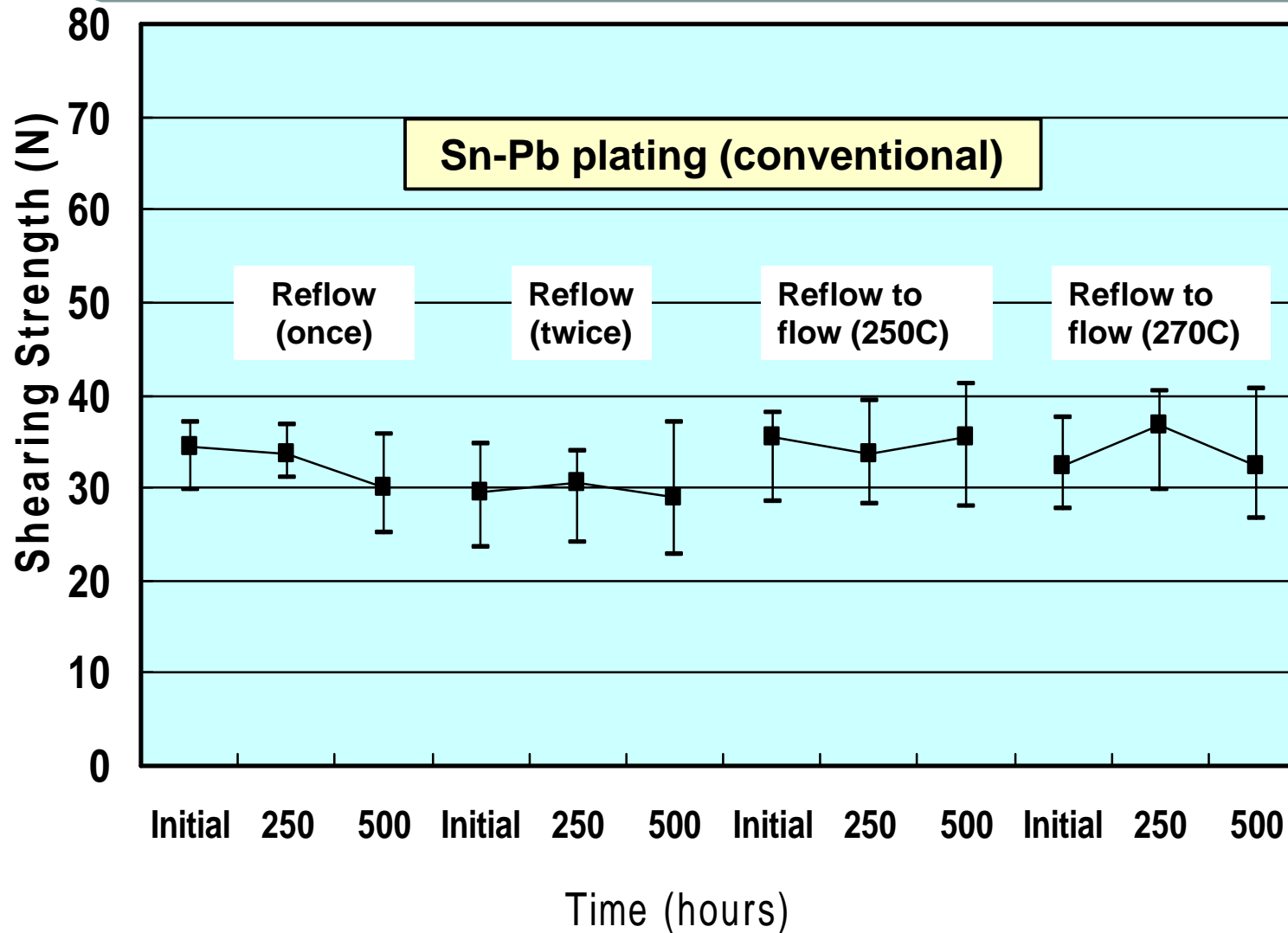
Joint Strength (with Temperature Cycle)



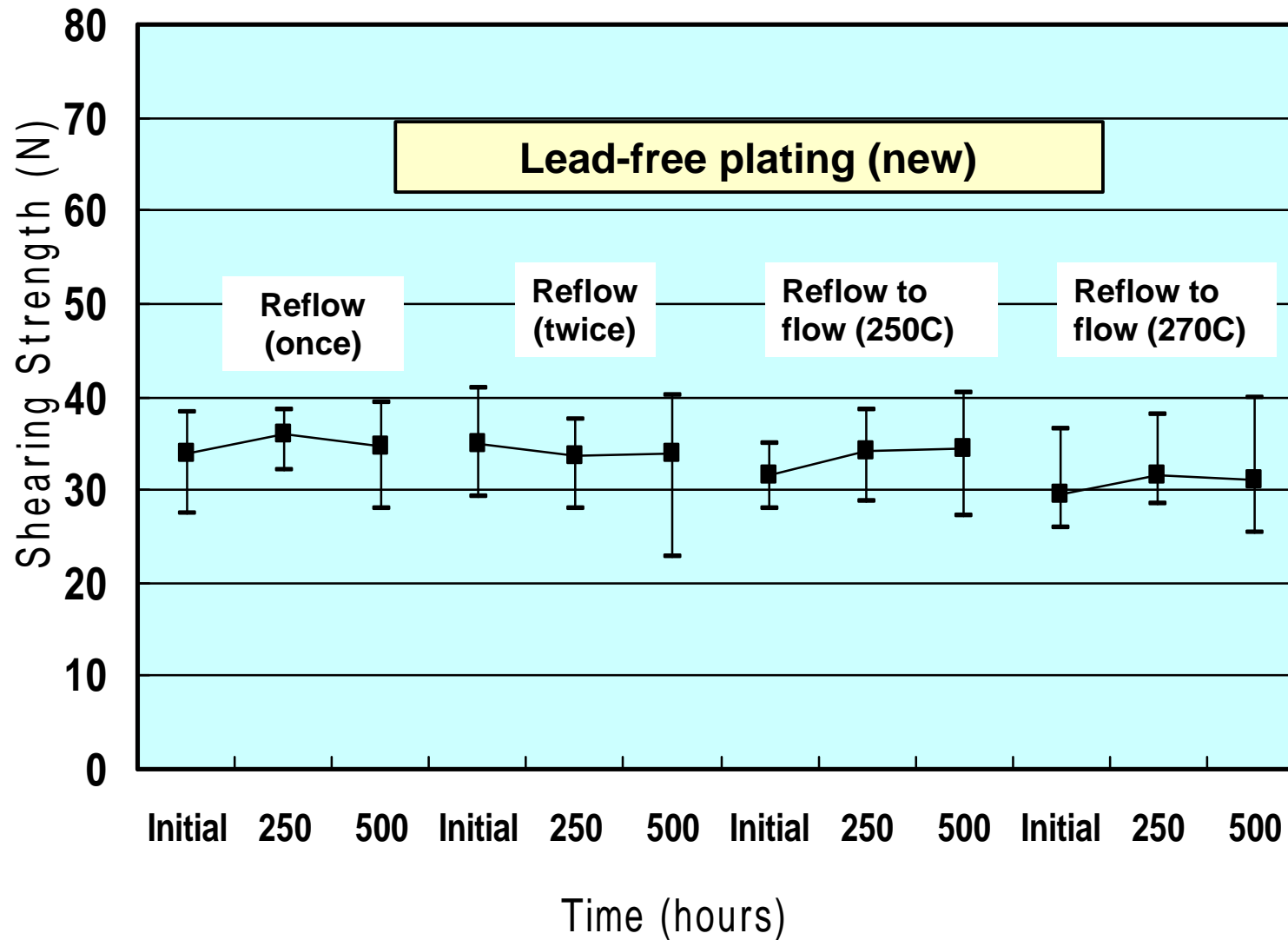
Joint Strength (with Temperature Cycle)



Joint Strength (with High Temperature Storage)



Joint Strength (with High Temperature Storage)



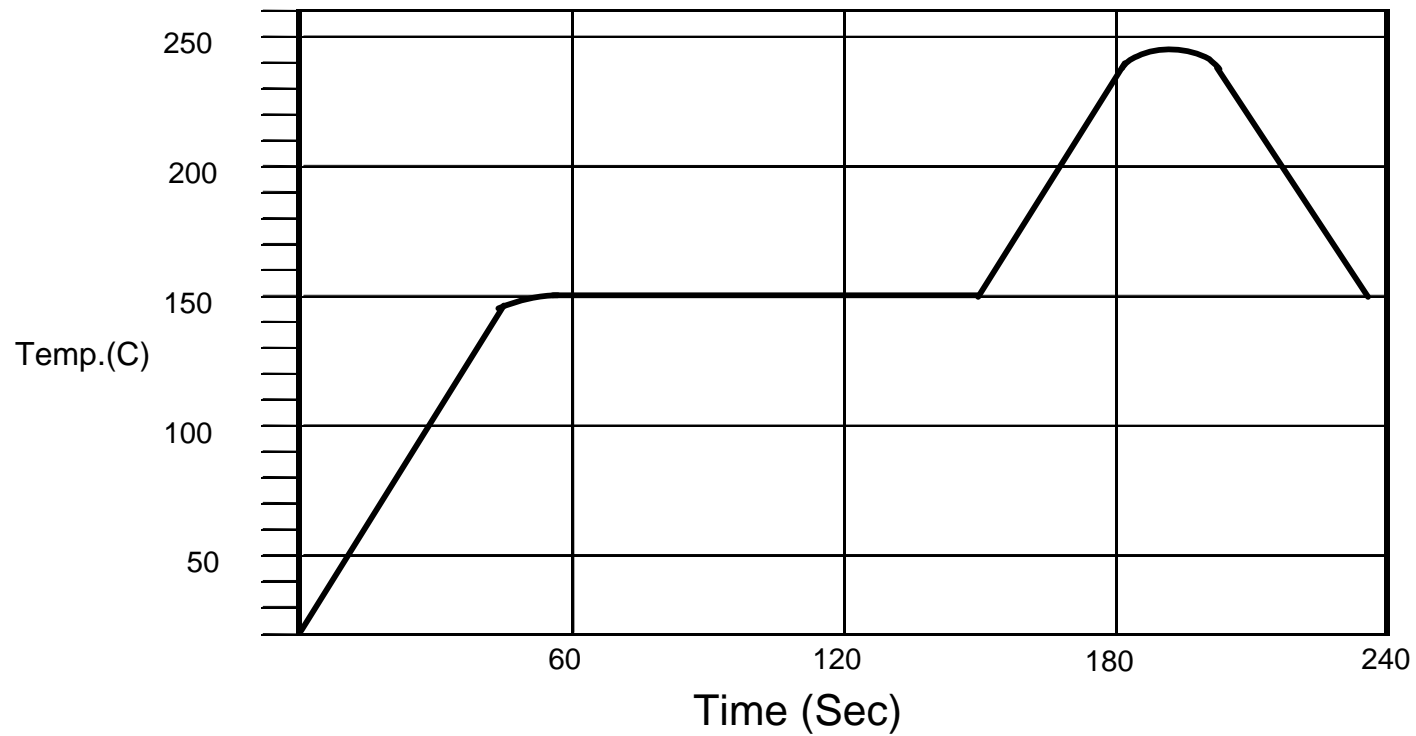
Conclusions

1. Tin(Sn) plating terminal shows better solder wetting rate results than other lead-free plating terminals, where conventional Sn/Pb plating terminal shows slightly better results.
2. Tin(Sn) plating terminal shows almost no deterioration of the resistance to the shearing force after 500 cycles of temperature cycling, or after 500 hours of high temperature. There are no significant differences between Tin plating and conventional Sn/Pb plating, or among various mounting conditions.

Supplement 2

- Recommended Reflow Profile -

Recommended Reflow profile for Lead-free Terminal Chip Ta Capacitors



Recommendation

Pre-heat; 150 - 180C, 90sec Max

Soldering; 245C peak

Temp. over 230C, 20sec Max