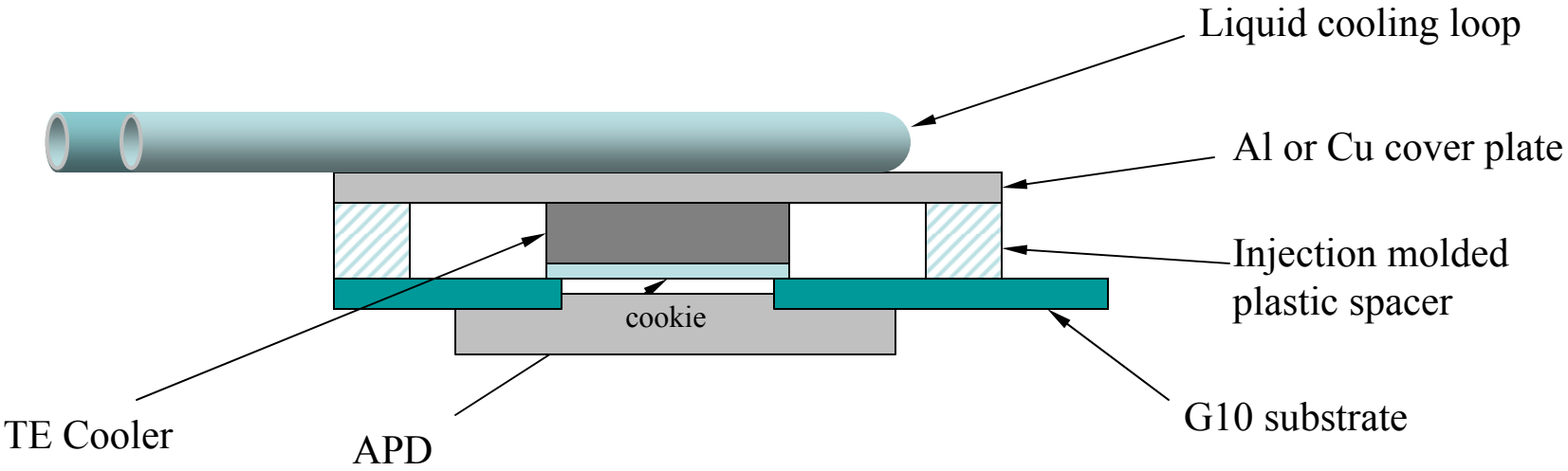
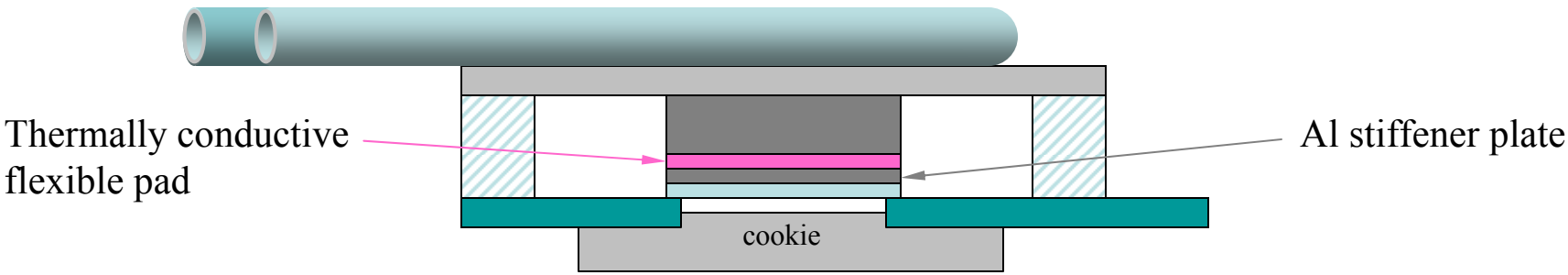
APD Module package conceptual design - A



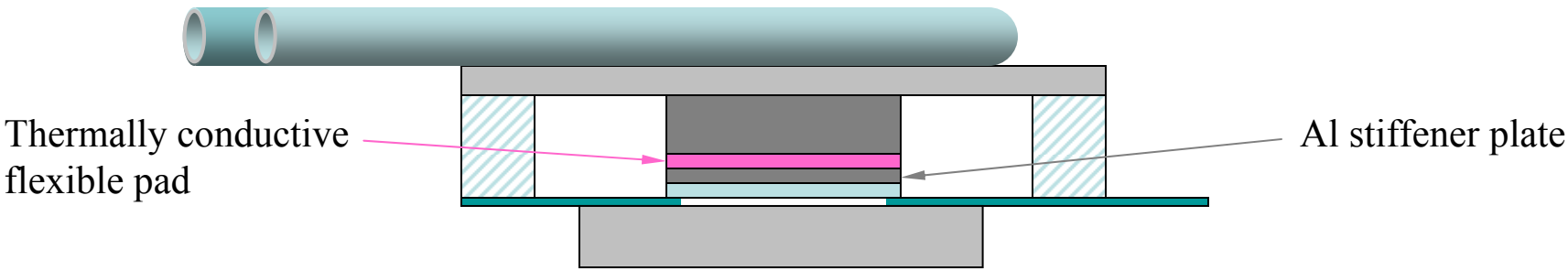
- Al cover plate epoxied to spacer / Ag epoxy to TE cooler
- No provision for expansion/contraction of TE cooler → Potential damage to ball bonds??
- Precision spacing for cookie provided by precision G10 thickness (+/- 50 u tolerance) or precision "stops"

APD Module package conceptual design - B



- Allows thermal expansion of TE cooler → stress relief for bump bonds
- Precision spacing for cookie provided by precision G10 thickness (+/- 50 u tolerance) or precision "stops"

APD Module package conceptual design - C



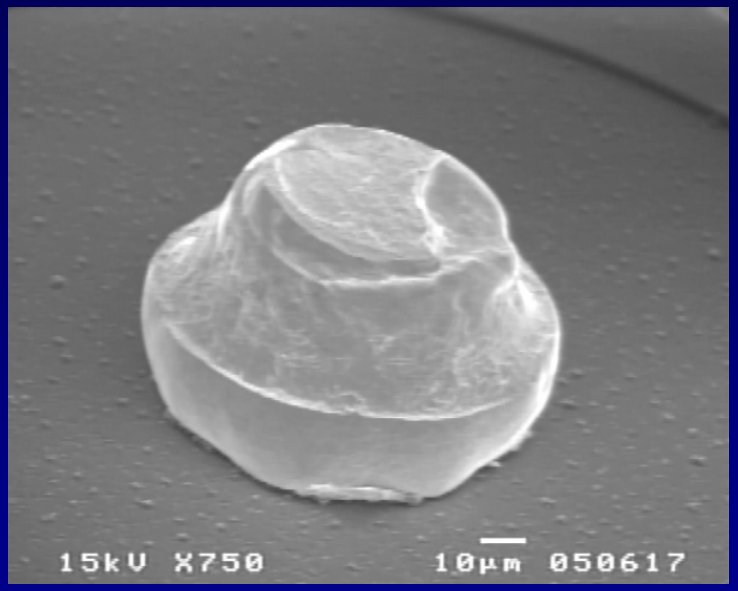
• Precision spacing for cookie provided by thin G10 (~ 250 u) or thin Kapton (~ 100 u)
→ Is bump bond technique compatible with Kapton flex circuit?

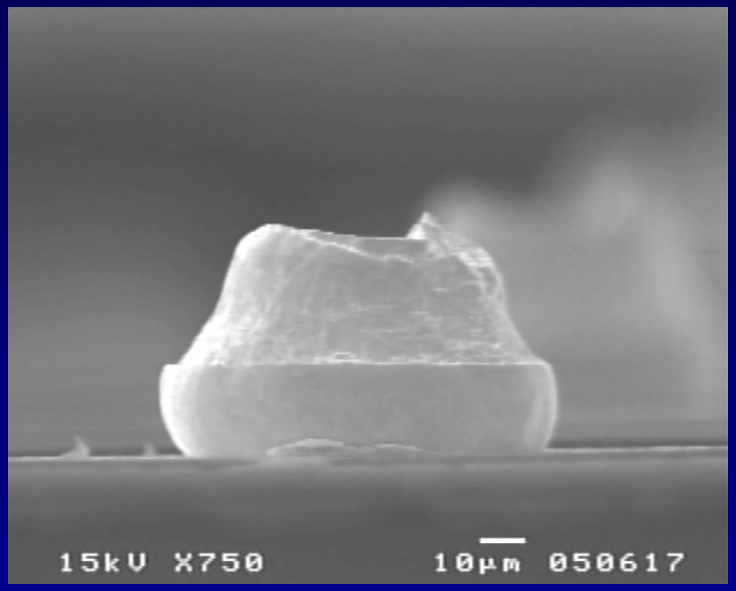
APD array for NOVA

- **Gold Bump Bonding**
- **Design of APD array**
- **Cooler**
- **Assembly**

2005/08/09

Gold Bump Bonding

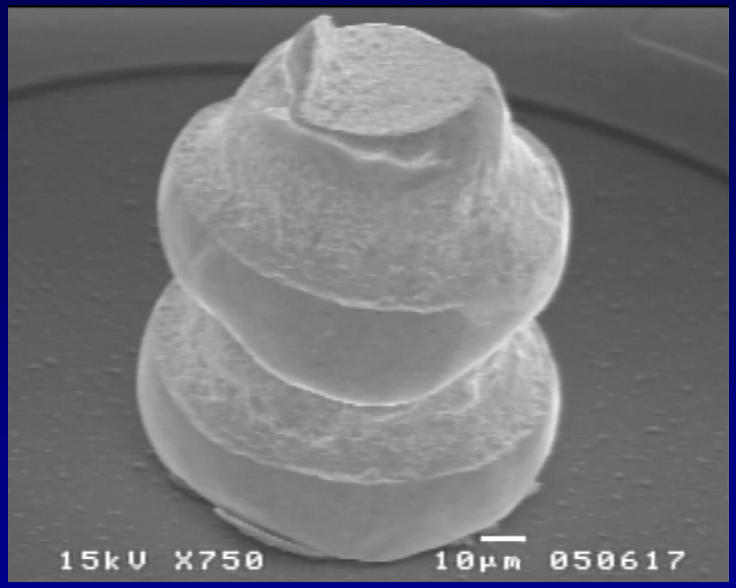


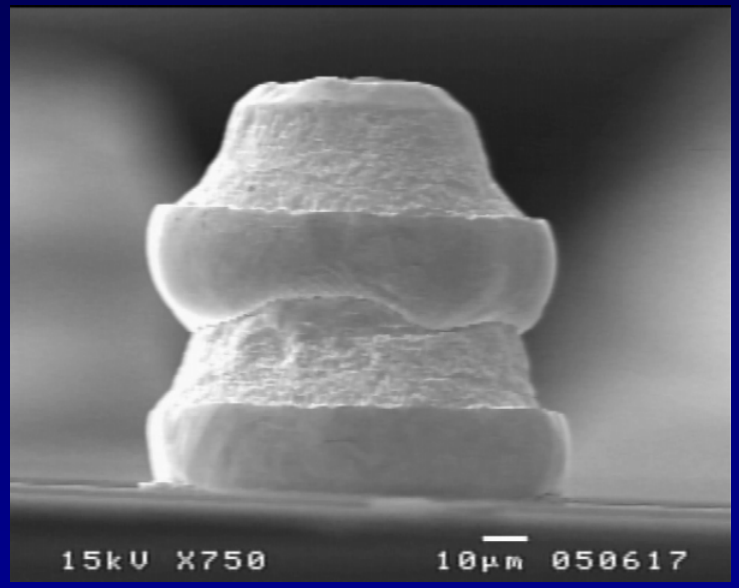


Diameter : ~100µm

Height : ~50µm

Gold Bump Bonding -2

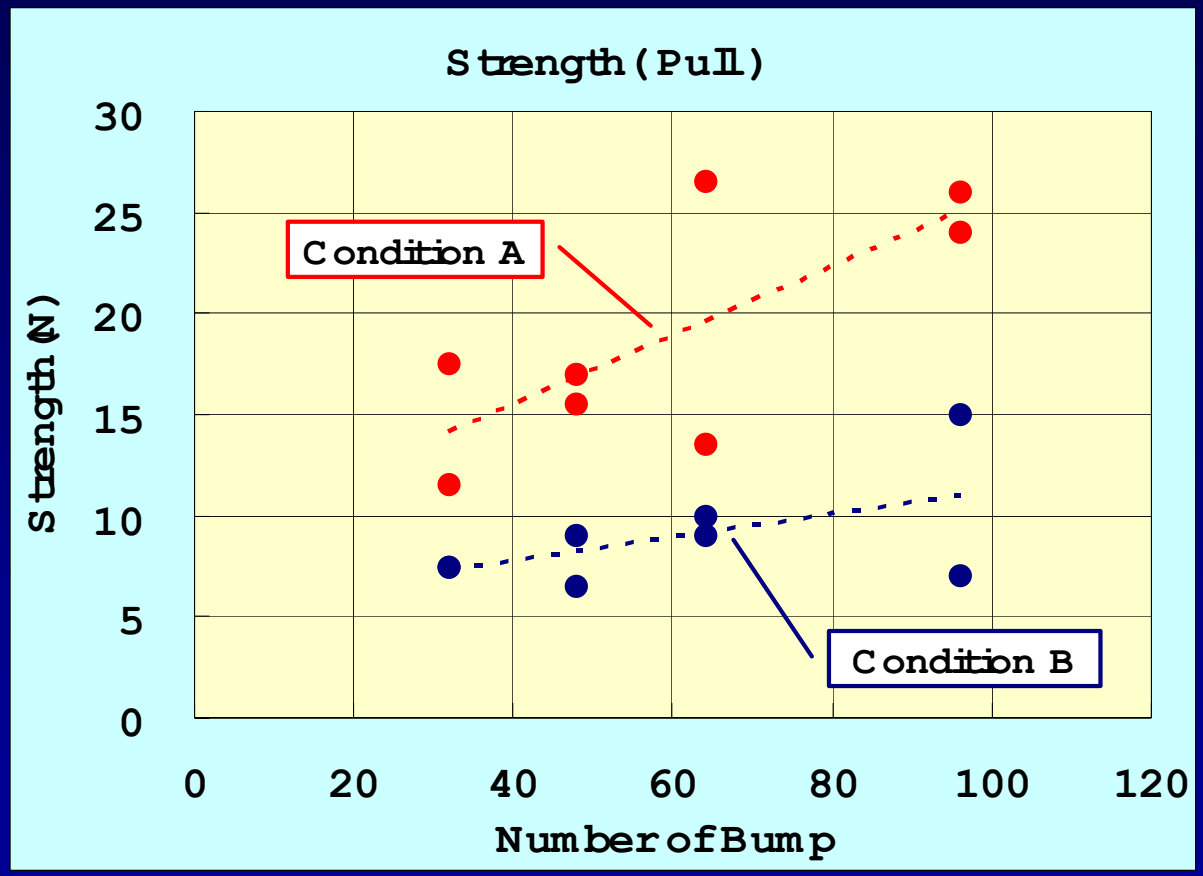




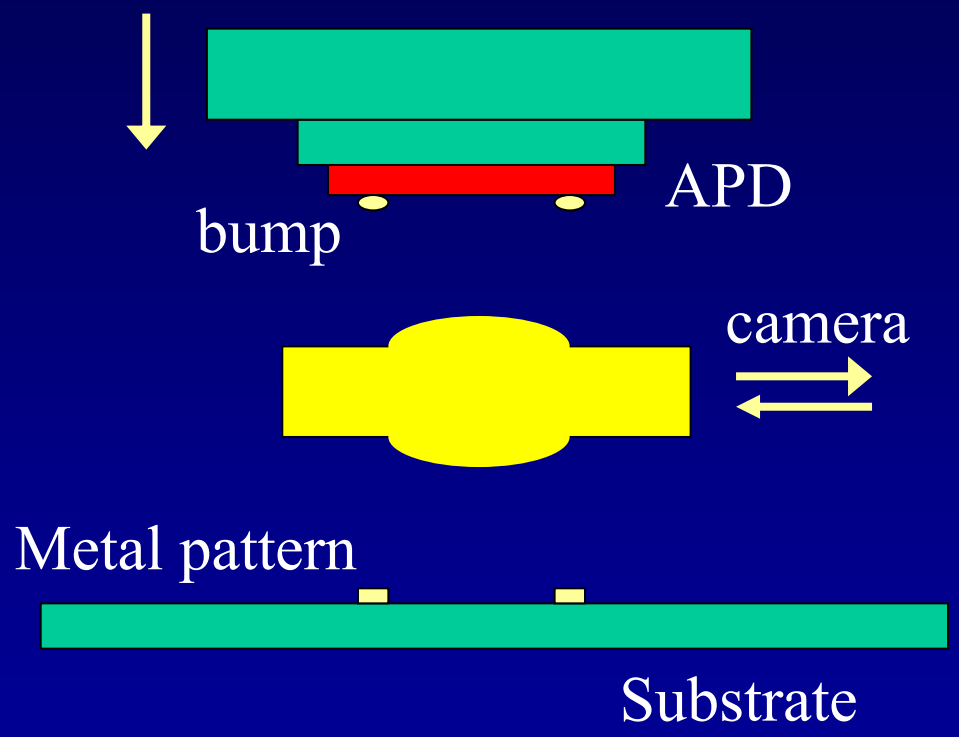
Diameter : ~100µm

Height : ~90µm

Strength of Bump



Flip chip Bonding



Position tolerance

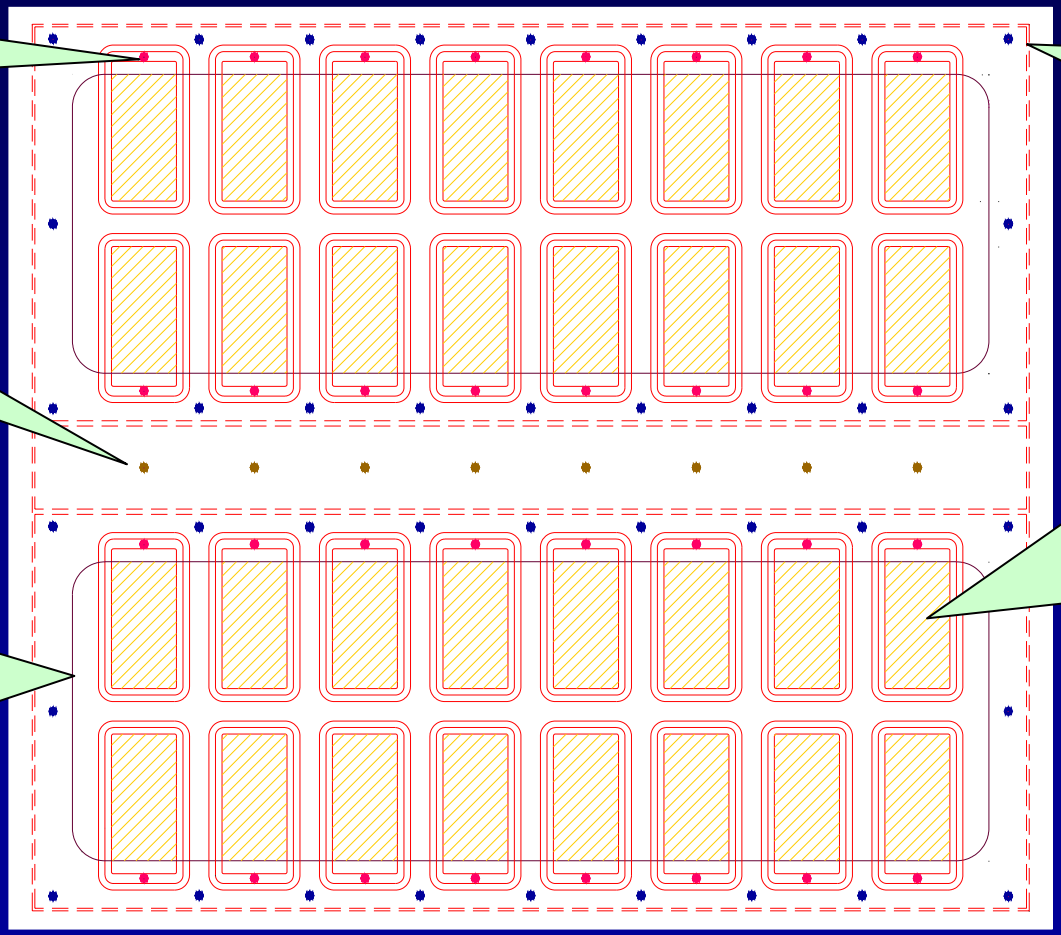
±20μm

Requirements for substrate

- Thickness of plating :
  Ni 5μmMIN / Au 0.5μmMIN
- Flatness : ±20μm
- Target for alignment
- Protection against discharge
  Ex. resist film

Design of APD array (preliminary)

Number of bump : 80

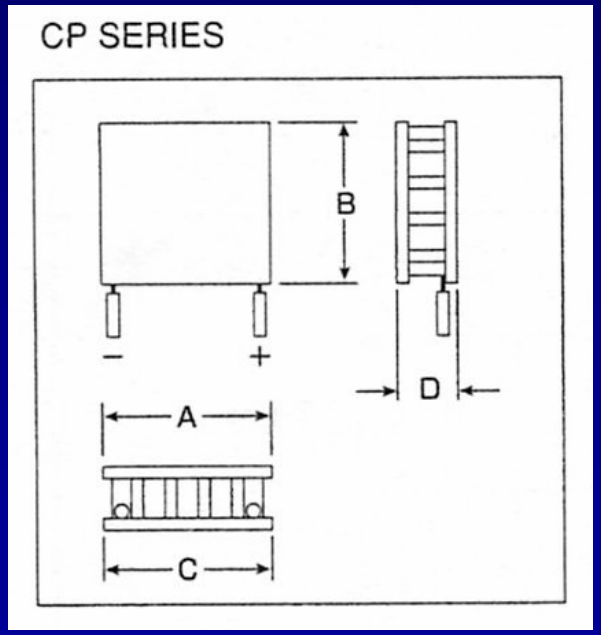


TE cooler

Candidate of TE cooler :

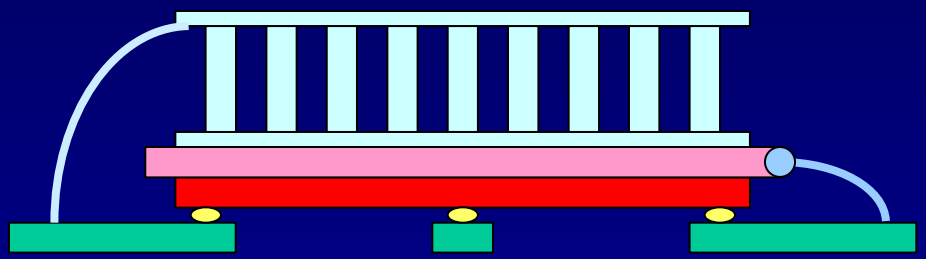
MELCOR CP 1.4-17-10L

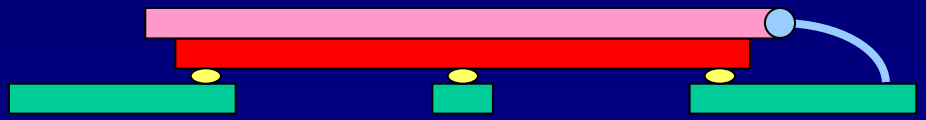
Catalog Number	I_{MAX} (Amps)	T_H=25°C Q_{MAX} (Watts)	V_{MAX} (Volts)	ΔT_{MAX} (°C)	N	Dimensions,mm A	B	C	D
CP 1.4-11-10L	3.9	2.9	1.33	70	11	10	15	10	4.7
CP 1.4-17-10L	3.9	4.5	2.06	70	17	15	15	15	4.7
CP 1.4-31-10L	3.9	8.2	3.75	70	31	20	20	20	4.7
CP 1.4-35-10L	3.9	9.2	4.24	70	35	15	30	15	4.7
CP 1.4-71-10L	3.9	18.7	8.60	70	71	30	30	30	4.7
CP 1.4-127-10L	3.9	33.4	15.4	70	127	40	40	40	4.7



Assembling procedure

1. Flip chip bonding
2. Inspection
3. Sub-mount
4. Cooler
5. Temp. sensor
6. Inspection



Assembling procedure

1. Flip chip bonding
2. Inspection
3. Sub-mount
4. -----
5. Temp. sensor
6. Inspection