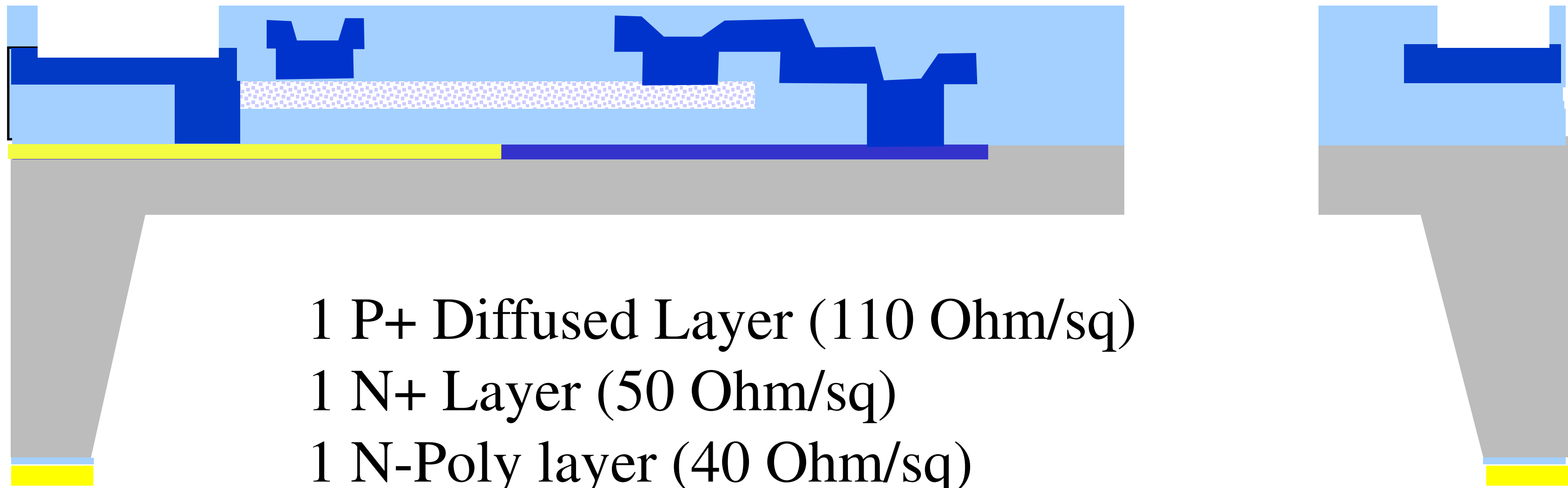
EMCR870 MEMS

Ivan Puchades

092 Quarter/Winter 2010

RIT MEMS BULK PROCESS



1 P+ Diffused Layer (110 Ohm/sq)
1 N+ Layer (50 Ohm/sq)
1 N-Poly layer (40 Ohm/sq)
1 metal layer (Al 1µm thick)
Top Passivation
Top hole
15-30 µm Si diaphragm

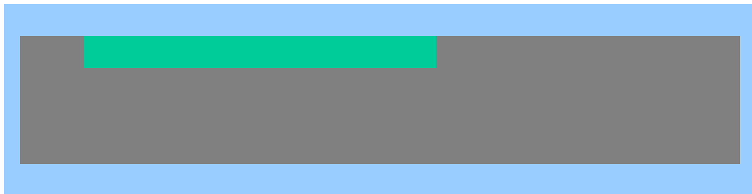
4” wafers – qty 8
Grind and CMP backside

Grow 5000Å oxide – recipe 353
Actual - 5080Å

Photo 1 – P+ Diffusion
BOE Etch (7 min – 900Å/min)

Spin on glass – Borofilm 100

Dopant diffusion – recipe 354
Etch SOG and masking oxide
Rs= 47 ohm/sq



Grow 5000Å oxide – recipe 350
Actual - 5100Å

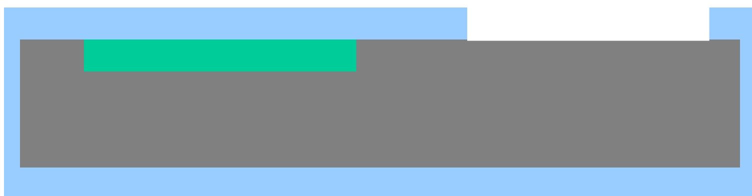
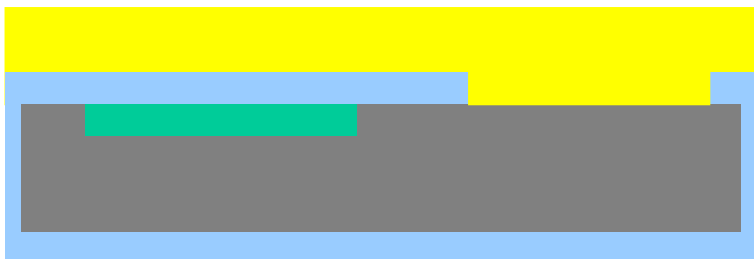
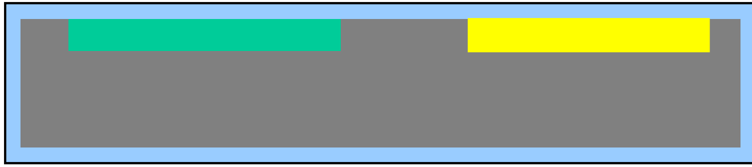


Photo 2 – N+ Diffusion (layer 6)
BOE Etch (7 min – 900Å/min)

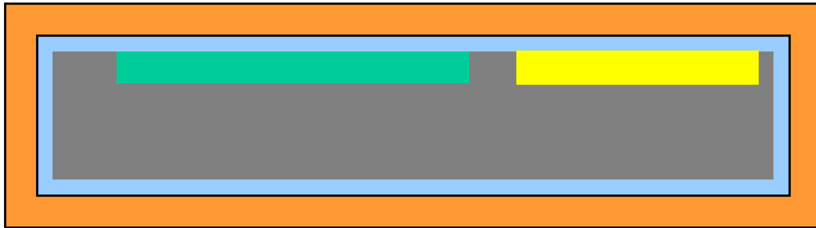


Spin on glass – N250

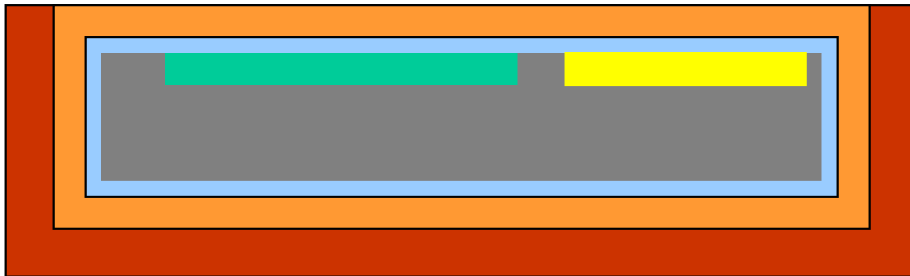
Dopant diffusion – recipe 115
Etch SOG and masking oxide
N+ 6.7ohm/sq, P+ 110ohm/sq



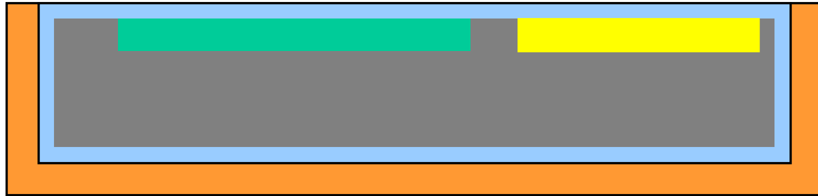
Grow 500Å Pad oxide recipe 250
800Å over N+
510Å over P+



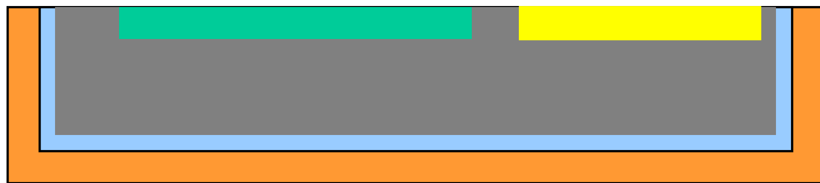
1500Å Nitride Deposition LPCVD
Actual 1550Å



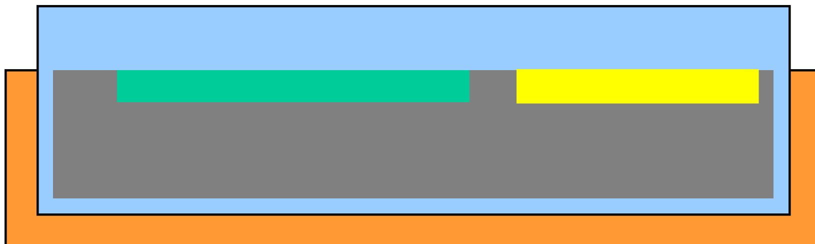
Coat backside and sides with PR.



Etch nitride from front of wafer.
LAM490 2’40” + 20% oe
Remove resist



1 min BOE Etch to remove pad ox
RCA Clean



Grow 5000Å wetox – recipe 350
Actual 5495Å

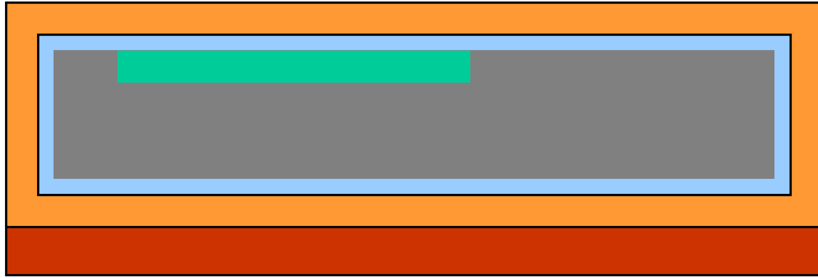


Photo 2 – Diaphragm
Coat back

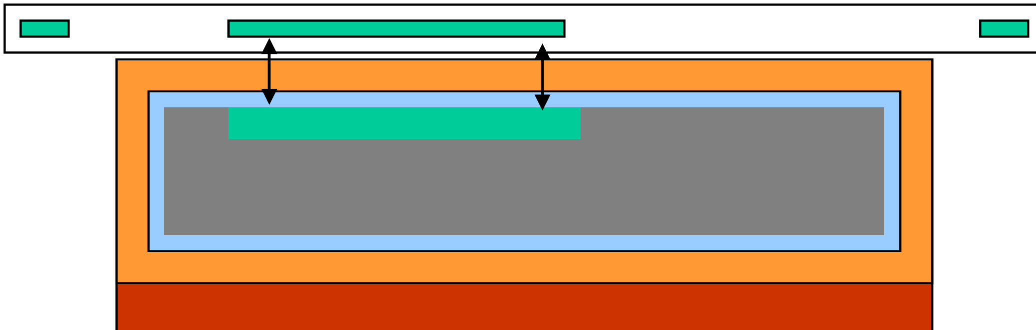


Photo 2 – Diaphragm
Align front

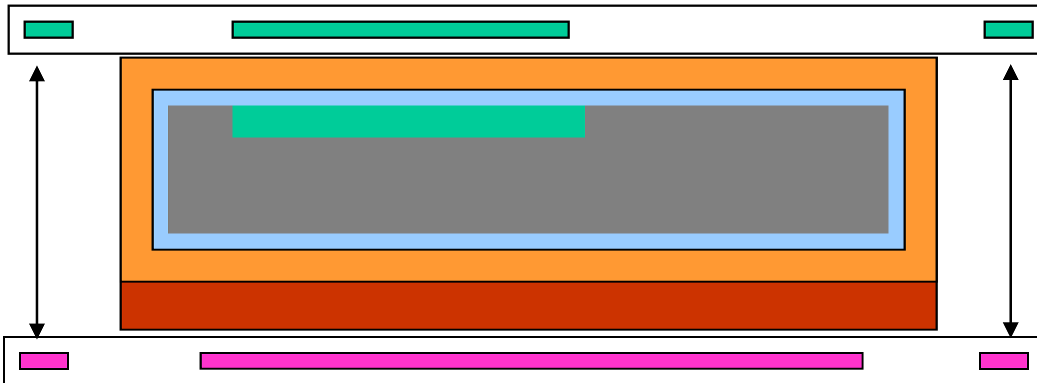


Photo 2 – Diaphragm
Align back to front

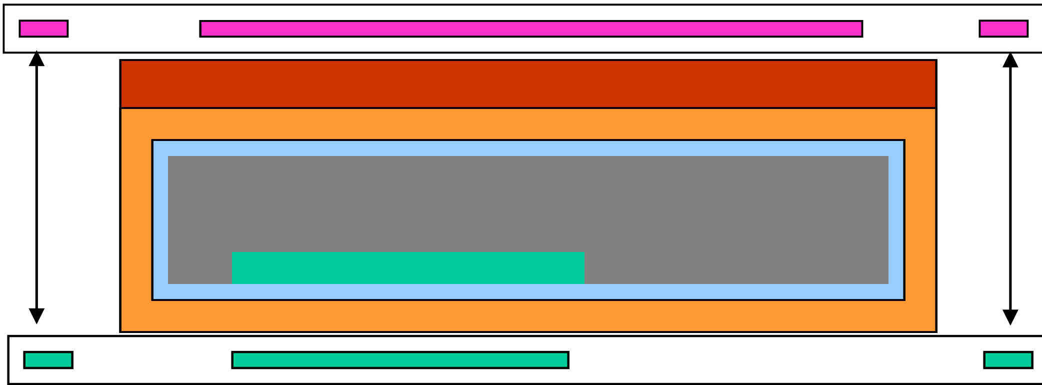


Photo 2 – Diaphragm
Flip and expose
20 sec exposure

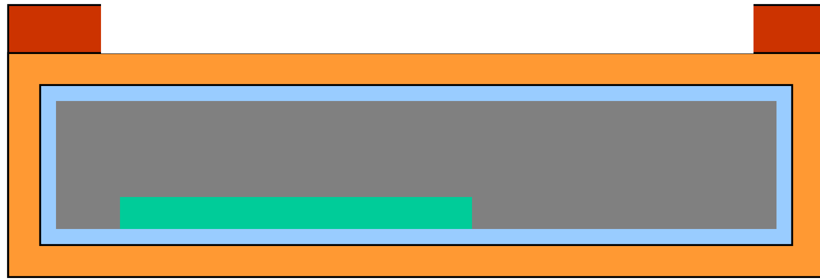


Photo 2 – Diaphragm
Develop

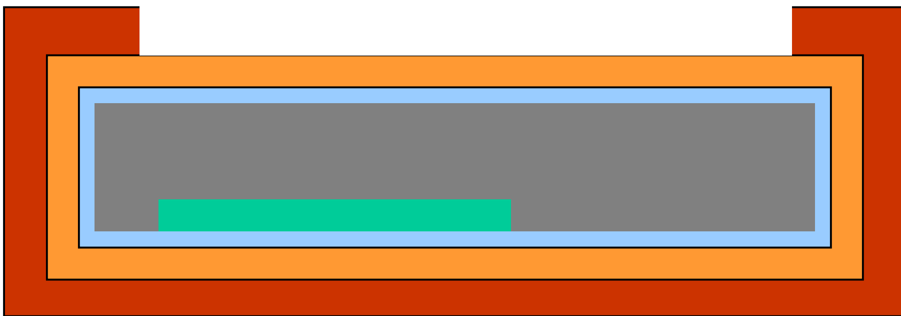
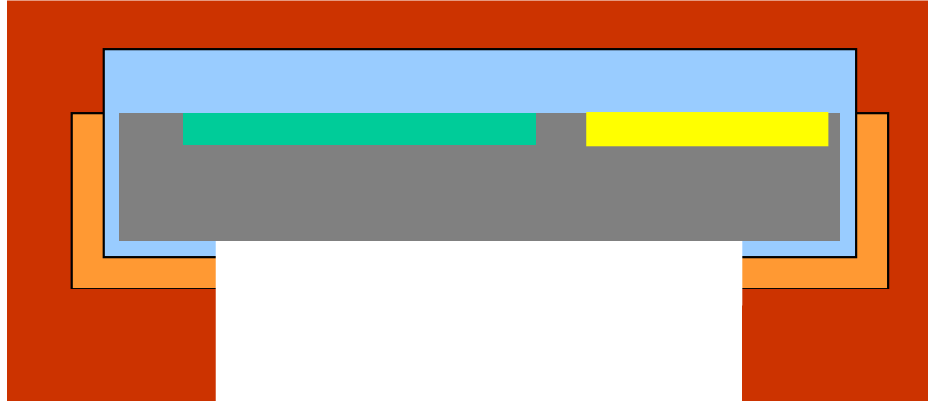
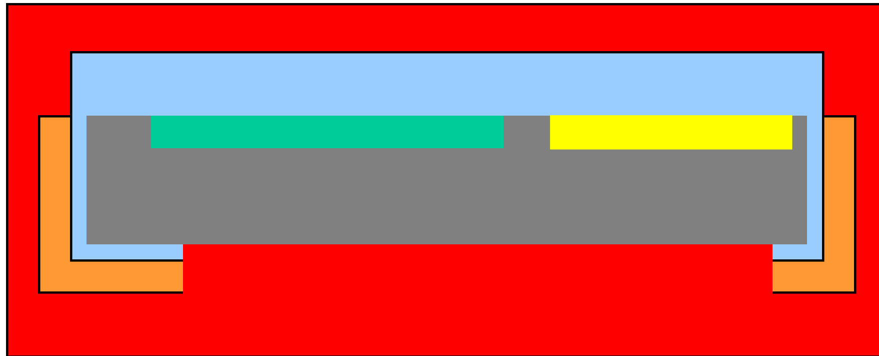


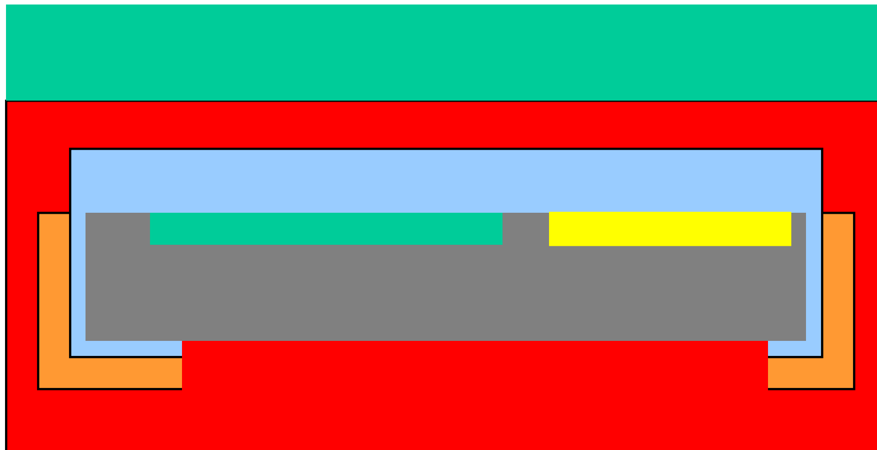
Photo 2 – Diaphragm
Protect front and edge



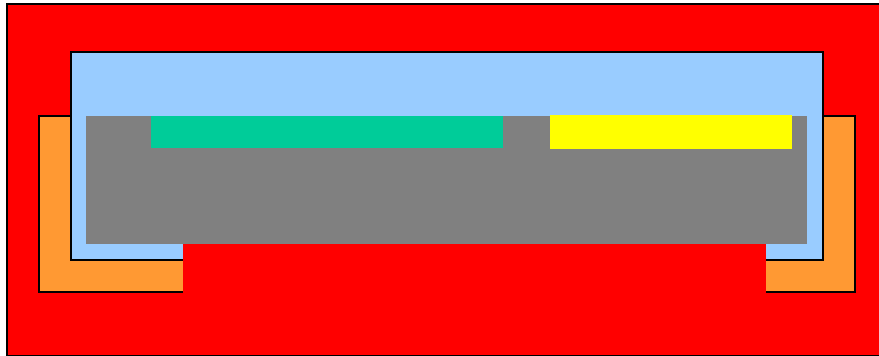
1min BOE for oxynitride
Nitride etch in LAM490 –
1 min BOE to remove pad ox.
Strip resist in solvent.



LPCVD Poly deposition 6KÅ
86min Dep



Spin on glass – N250
3,000rpm, 30 sec
20 min at 200C in Air
Diffuse with recipe 120



Etch SOG – 6min in BOE
Rs= 63.5 ohm/sq

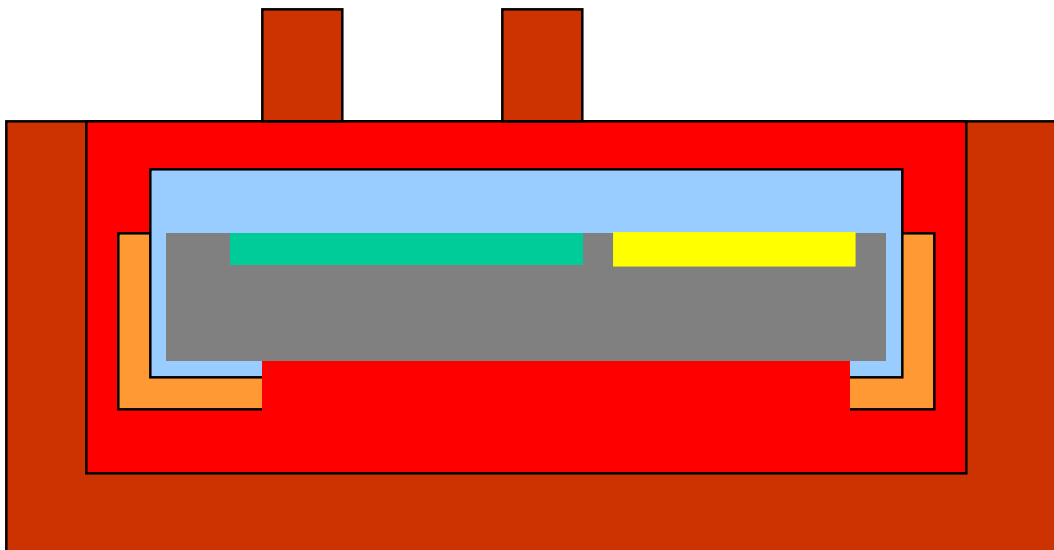
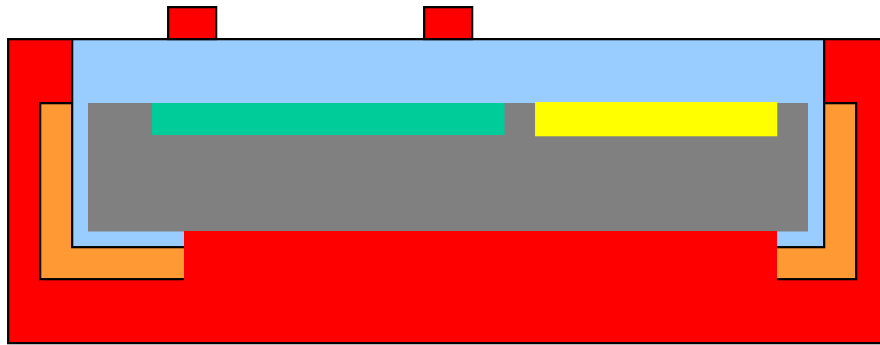
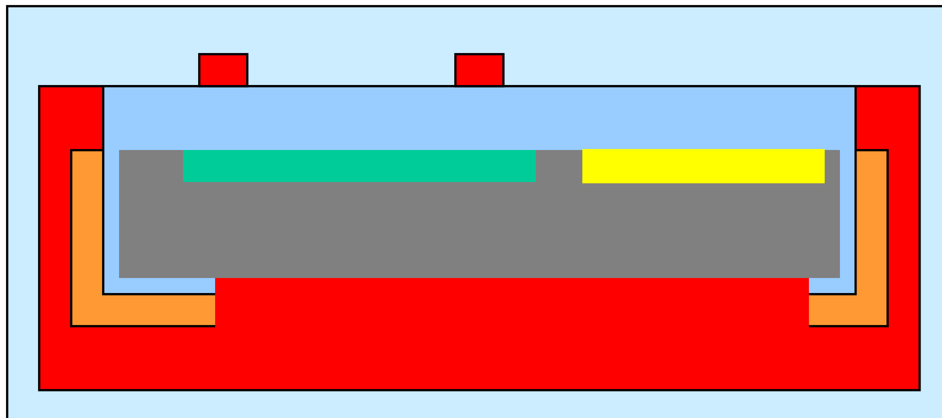


Photo 3 – Poly
Protect back and sides



Poly Etch
1min05sec LAM 490

Poly REOX – recipe 250



10KÅ LTO Dep

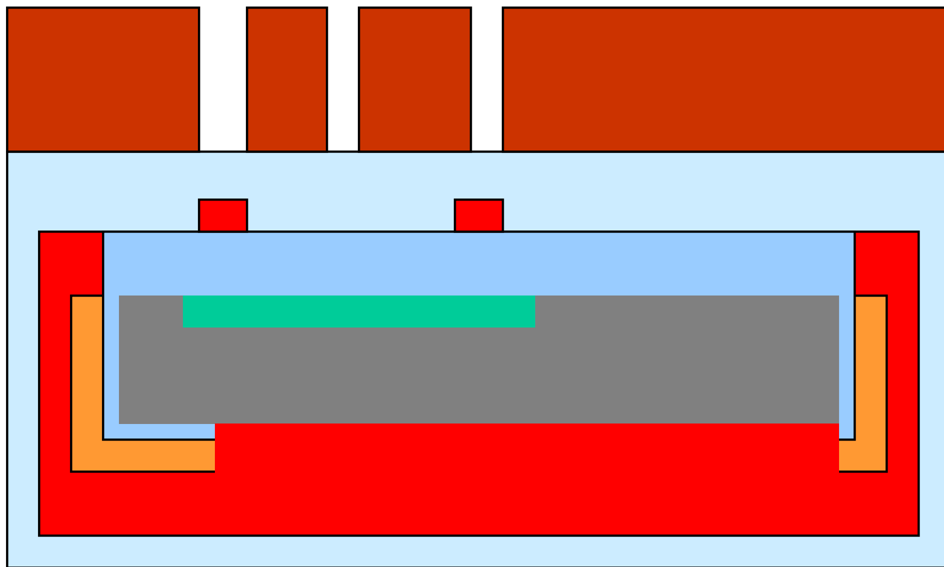
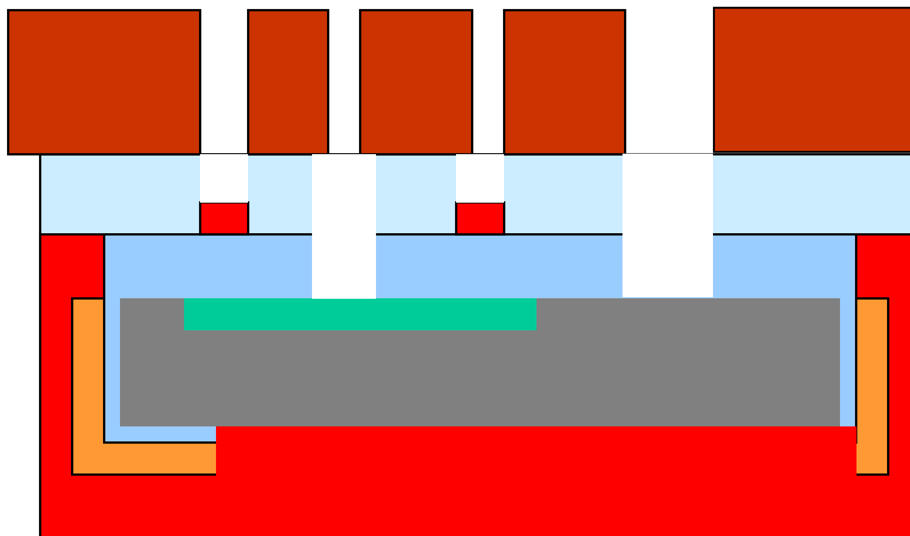
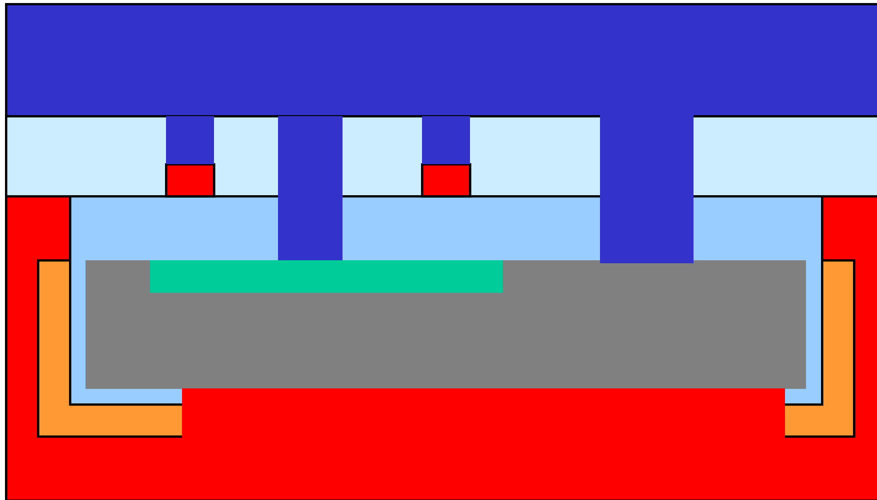


Photo 4 – Contact cut
No need to protect sides/back

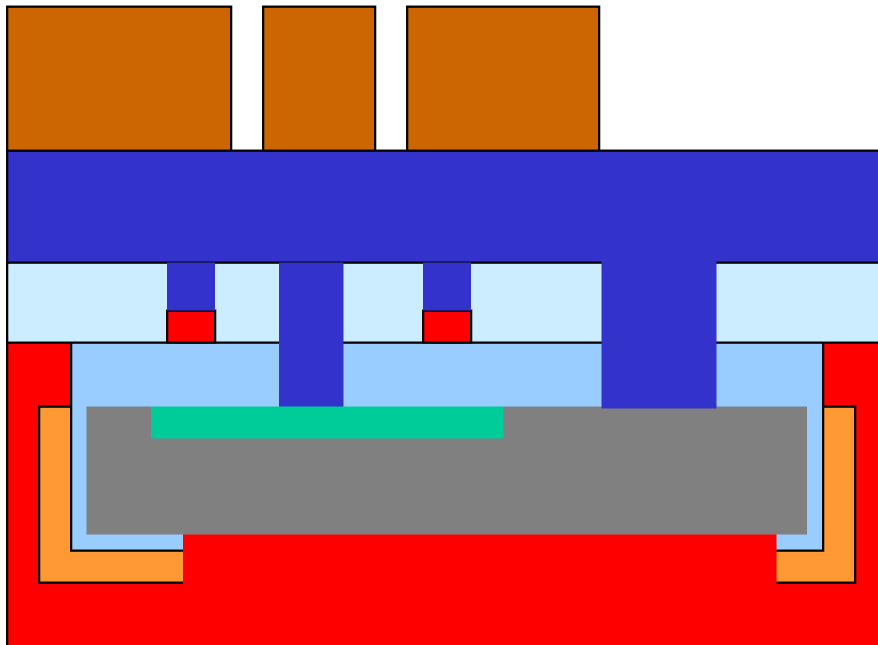


Contact cut etch
5.2:1 BOE – 10min
LTO etch rate >2KÅ/min
Thermal ox ~1100Å/min

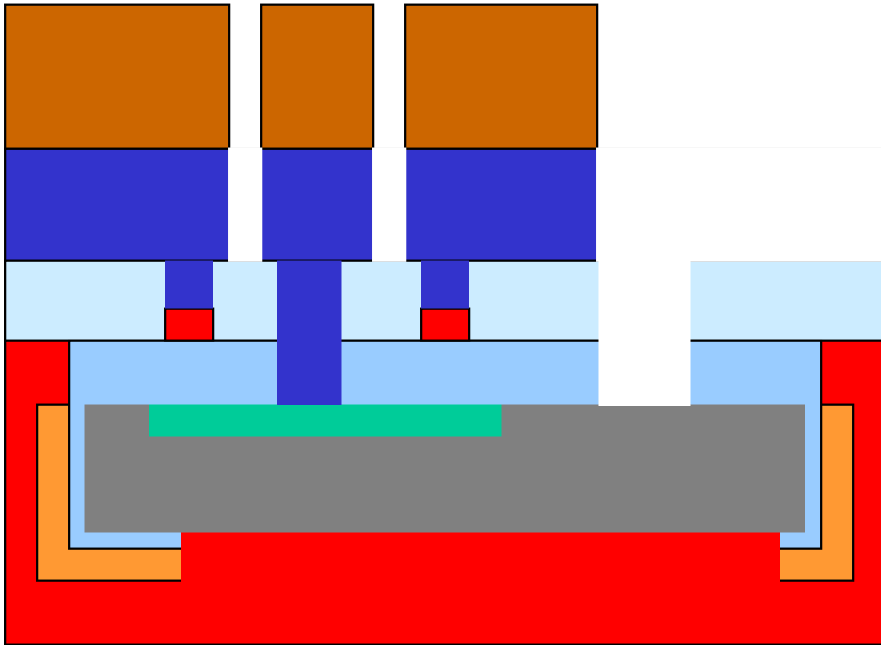
RCA Clean – extra HF



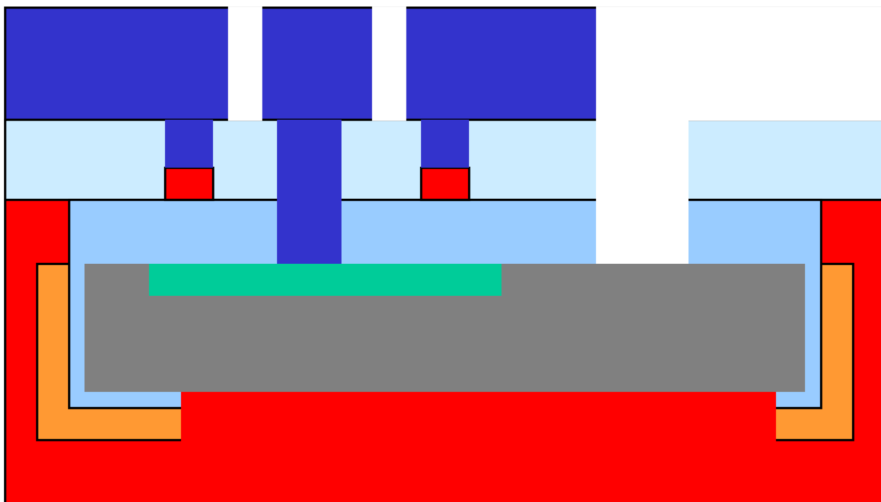
Metal Deposition
1um Al
2000 Watts, 5mTorr,
33minutes



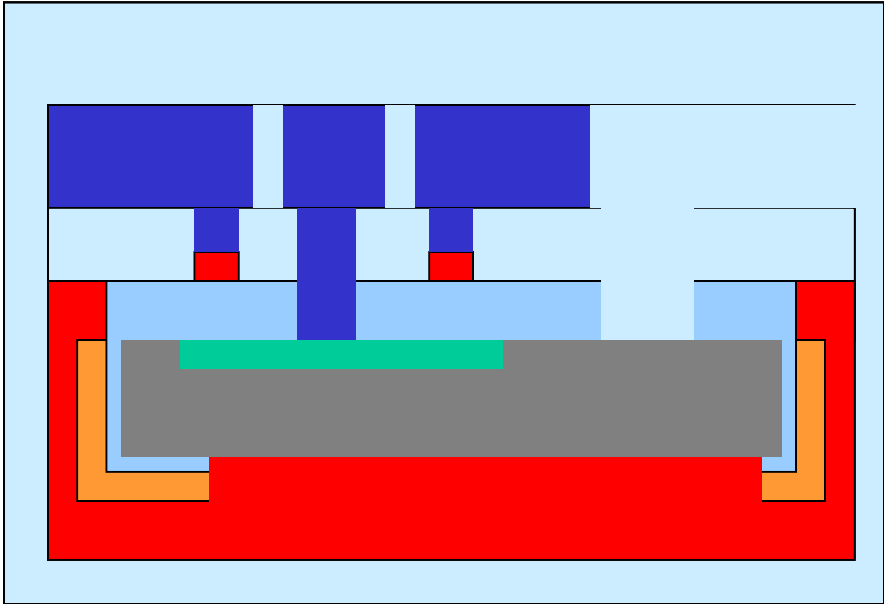
Metal 1 photo
Reduced exposure dose



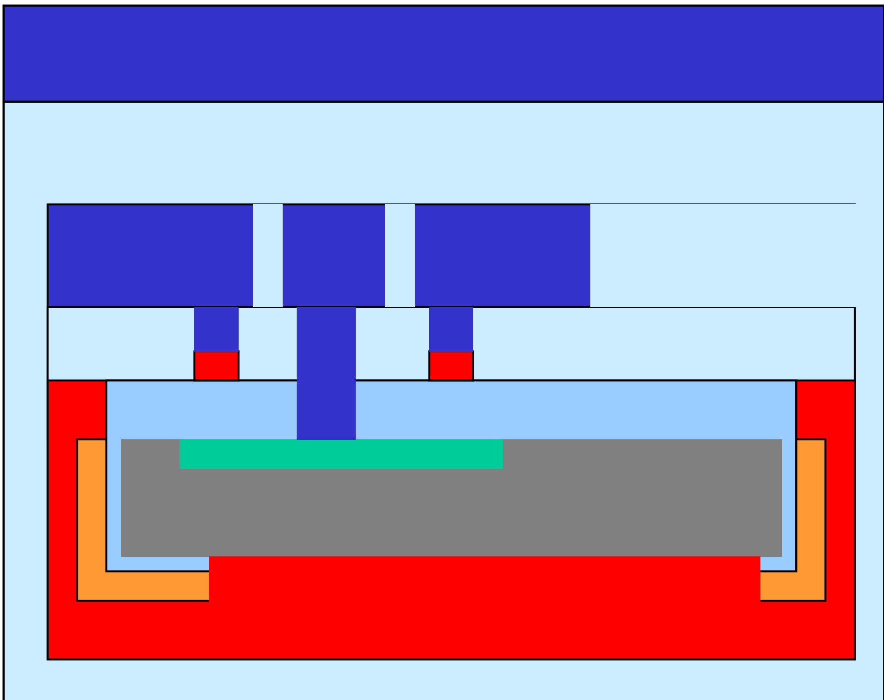
Metal 1 etch
Visual endpoint ~4 min



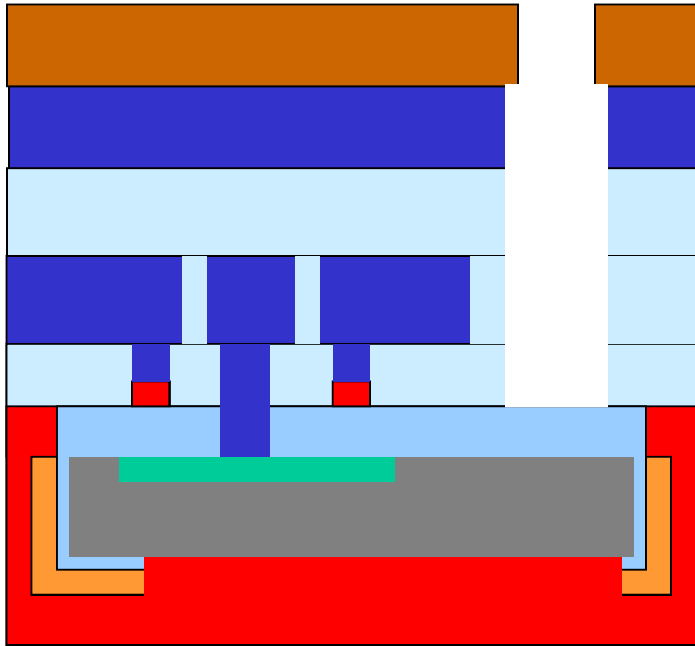
Solvent strip photoresist



ILD1 LTO Dep
8,000Å LTO



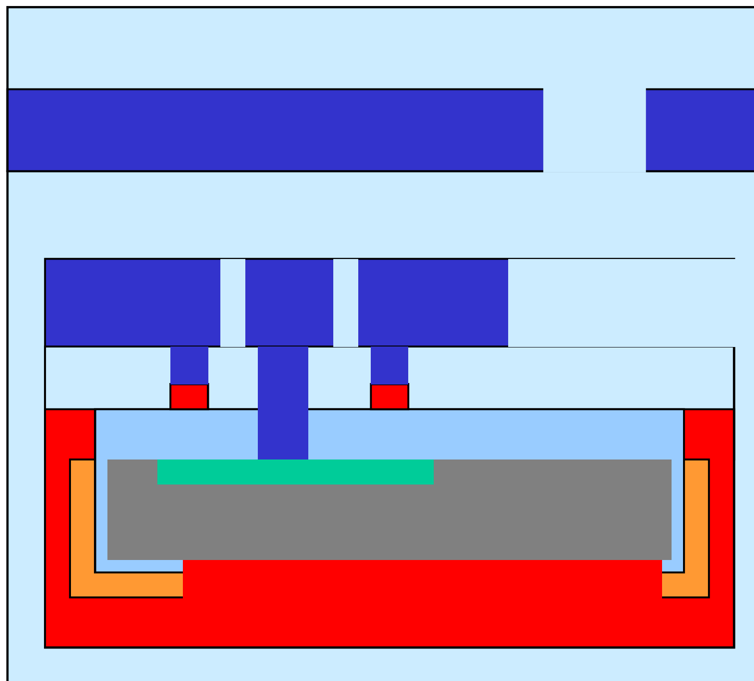
Top Metal Deposition
0.75 um Al



Top Metal Photo 7
Alignment mark issues

Top Metal Etch

ILD1 Etch



Remove resist

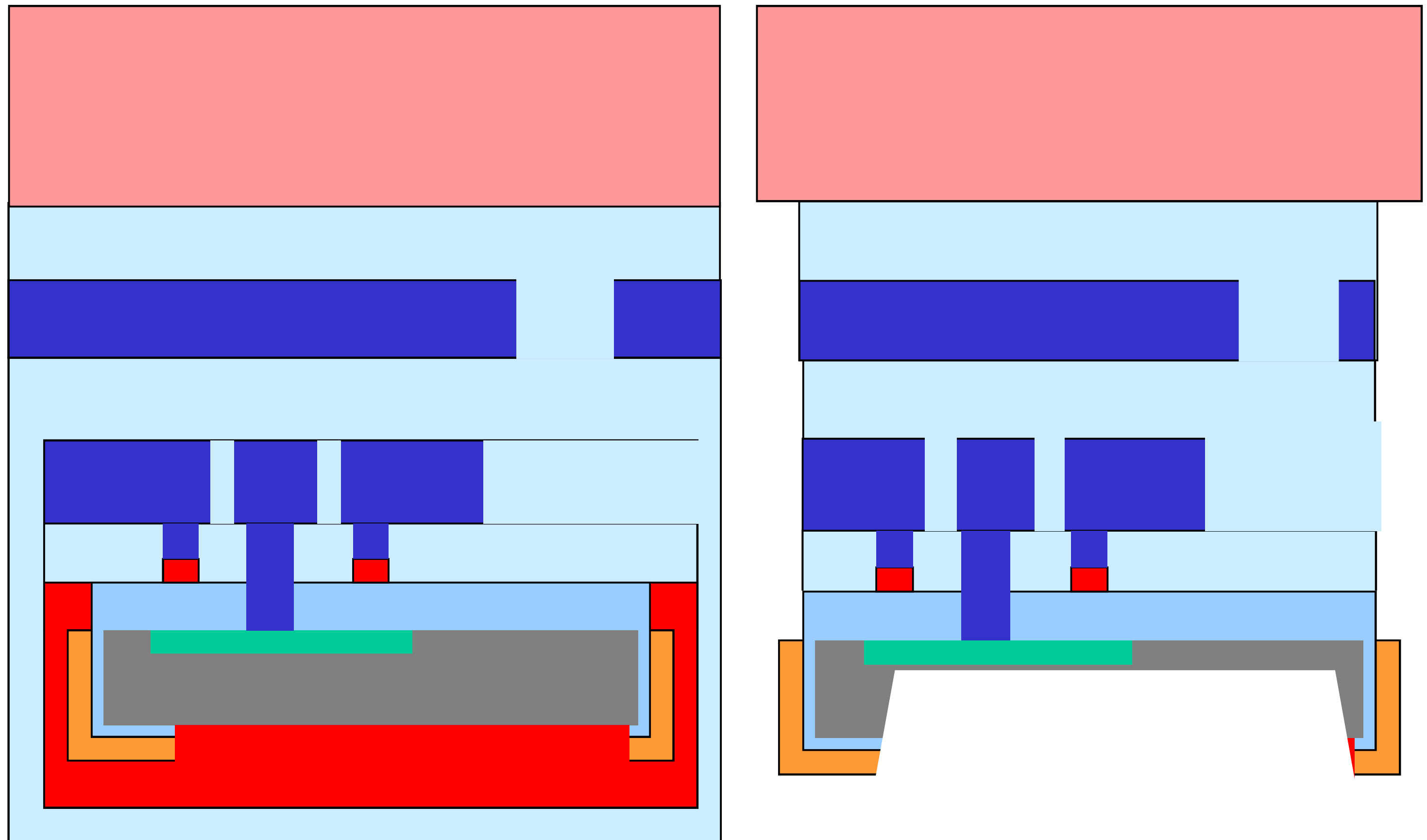
PROTEK Adhesion LTO

•Spin on primer adhesion promoter (1500 rpm, 60sec). Bake at 130C for 60sec.

•Spin on ProTEK (1500 rpm, 90sec). Bake on hot plate 130C for 120sec, oven bake at 200C for 30min.

•LTO etch

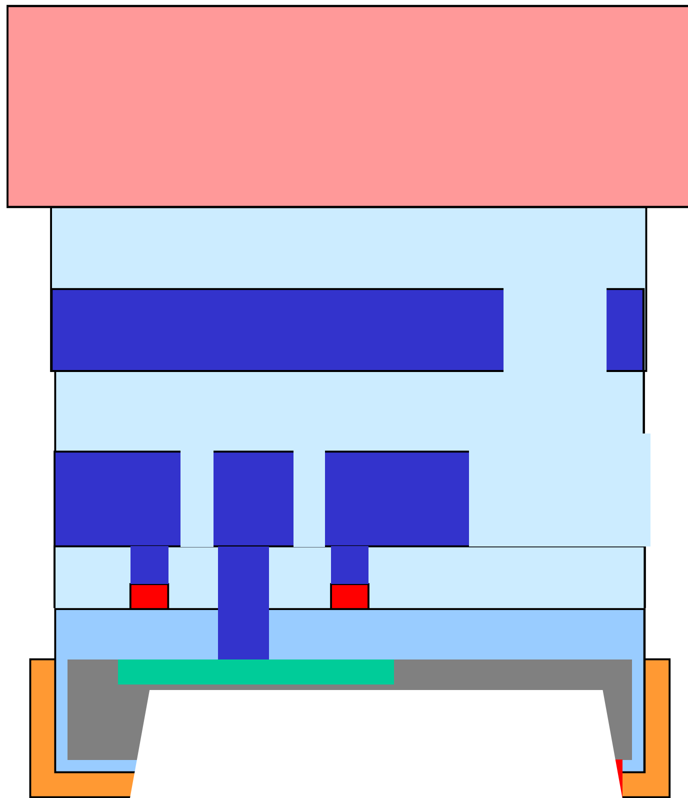
•KOH Etch

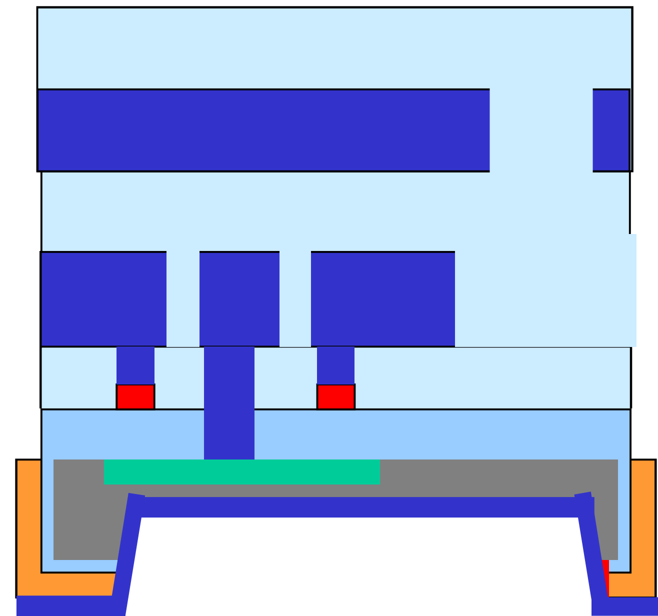


•ProTEK stripper (solvent)

•Deposit Aluminum on the back side of wafer to protect silicon diaphragm thickness.

0.5um in CVC 601.





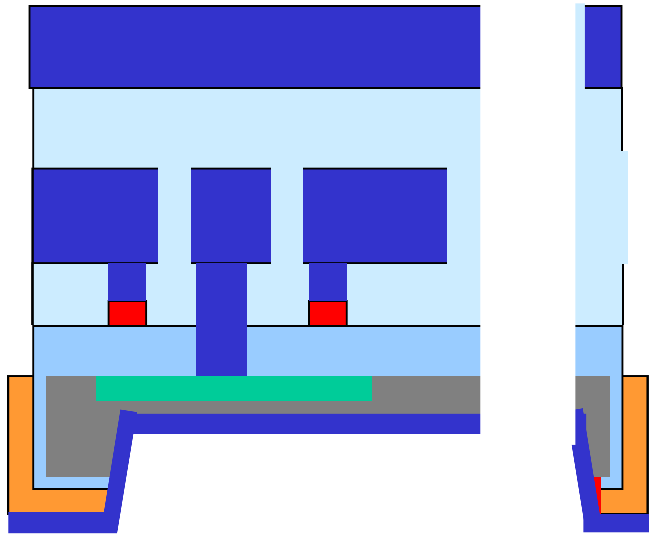
•Saw wafers

•Individual devices have been broken up in chips.

•Select the best chips and finish up the last steps of the process.

•Top hole etch in SF6+O2 in Lam490 or Drytek.

  •This removes top LTO, too.



•Remove top LTO if not removed during top hole etch.

•Remove Top Metal

  Aluminum etch ~3min

•Remove ILD1 LTO

  Pad etch ~ 4min

•Package and TEST ☺