



Application note 6 for the 2008 IC Cost Model – March 26, 2008

Using the Process Adder Sheet in the Model

Introduction

The 2008 IC Cost Model includes the '5 Process adders' worksheet that allows process steps to be added to process flows to model process flows that aren't already in the model. The '5 Process adders' page does however require careful use with a number of subtleties. In this application note some general comments and specific examples of how to use this page will be presented.

General comments

- Activating the sheet - at the top of the '5 Process adders' sheet cell D9 is a dropdown with the values of yes and no. If "yes" is selected then the base process is used unchanged and nothing entered on the '5 Process adders' page has any effect. If cell D9 is set to "no" then the values in column E will be added to the base process values in column D. The resulting values that will be modeled are displayed in column F.
- Photo steps – if a critical mask step is added then a critical track step should also be added, if a mid or non-critical mask step is added a non-critical track should also be added. Keep in mind that just adding a photo step is just a photo step and does not include any other associated processes such as implants or etches that might be part of a process flow.
- Metrology steps are particularly complex because a sampling plan is built into the model. General guidelines:
 - Each mask step has a CD SEM.
 - Each mask step has an Overlay.
 - Each mask step has a Defect Detection Pattern.
 - Inspect SEM is used ½ as often as Defect Detection Pattern.
 - Defect Detection No Pattern is done on all non photo steps (mask or track).
 - Transparent Film is used on all mask steps, all CVD steps and Spin-On.

Specific examples

Table 1 presents all of the values to be added for several of the more common process blocks that might be added to a process for customization. Please note that in each case these are the steps to be added for 1 block, if 2 blocks are required multiply each of these numbers by 2. For example; the threshold adjust is the numbers to add 1 threshold adjust, if 2 are required multiply each number by 2, if 3 are required multiply by 3 and so on.

	Additional well	Additional gate oxide thickness	Additional threshold voltage implant	Additional HALO/ext implant	High resistance polysilicon resistor	Salicide block	Critical litho copper layer	Mid litho copper layer	Non-critical litho copper layer	Metal-insulator-metal capacitor
Lithography										
Critical exposure	0	0	0	0	0	0	0	2	0	0
Mid exposure	0	0	0	0	0	0	0	0	2	0
Non-critical exposure	1	1	1	1	1	1	0	0	0	2
Critical track	0	0	0	0	0	0	2	0	0	0
Non-critical track	1	1	1	1	1	1	0	2	2	2
Etching and ashing										
Poly/gate	0	0	0	0	0	0	0	0	0	0
Metal	0	0	0	0	0	0	0	0	0	2
Si/trench	0	0	0	0	0	0	0	0	0	0
SiN	0	0	0	0	0	0	0	0	0	0
Oxide	0	0	0	0	0	0	0	0	0	0
Low-k via	0	0	0	0	0	0	1	1	1	0
Low-k trench	0	0	0	0	0	0	1	1	1	0
Isotropic	0	0	0	0	0	0	0	0	0	0
Ashing	1	0	1	1	1	0	0	0	0	0
Thermal										
RTA	0	0	0	0	0	0	0	0	0	0
Atmospheric furnace	0	1	0	0	0	0	0	0	0	0
Sub-atmospheric furnace	0	0	0	0	0	0	0	0	0	0
Ion implant										
Medium current	2	0	1	2	1	0	0	0	0	0
High energy	1	0	0	0	0	0	0	0	0	0
High current	0	0	0	0	0	0	0	0	0	0
Wet processing										
RCA clean	0	1	0	0	0	0	0	0	0	0
SC1 clean	0	0	0	0	0	0	0	0	0	0
SPM strip	0	1	0	0	0	1	0	0	0	0
Wet etch	0	1	0	0	0	0	0	0	0	0
Organic clean	0	0	0	0	0	0	2	2	2	2
Metrology and inspection										
Inspection SEM	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	1
Defect detection - no pattern	6	6	4	5	4	3	12	12	12	10
Defect detection - pattern	1	1	1	1	1	1	2	2	2	2
CD SEM	1	1	1	1	1	1	2	2	2	2
Overlay	1	1	1	1	1	1	2	2	2	2
Transparent film	1	1	1	1	1	1	3	3	3	2
Metal deposition										
Interconnect (aluminum stack)	0	0	0	0	0	0	0	0	0	0
Contact (for silicide)	0	0	0	0	0	0	0	0	0	0
Tungsten plug	0	0	0	0	0	0	0	0	0	0
Barrier	0	0	0	0	0	0	0	0	0	2
TaN with Copper	0	0	0	0	0	0	1	1	1	0
Copper plate	0	0	0	0	0	0	1	1	1	0
Chemical vapor deposition										
Interlevel dielectric 0	0	0	0	0	0	0	0	0	0	0
Plasma SiN	0	0	0	0	0	0	0	0	0	0
High density plasma	0	0	0	0	0	0	0	0	0	0
Poly/gate	0	0	0	0	0	0	0	0	0	0
Interlevel dielectric 1	0	0	0	0	0	0	0	0	0	0
Epitaxial	0	0	0	0	0	0	0	0	0	0
High-k	0	0	0	0	0	0	0	0	0	0
ALD high-k	0	0	0	0	0	0	0	0	0	0
Block and low-k	0	0	0	0	0	0	1	1	1	0
Spin-on										
SOG or low-k	0	0	0	0	0	0	0	0	0	0
Chemical mechanical processing										
Dielectric	0	0	0	0	0	0	0	0	0	0
Tungsten	0	0	0	0	0	0	0	0	0	0
Copper	0	0	0	0	0	0	1	1	1	0