Metal Resistivity

Table 4.6 Bulk resistivity of pure metals at 22° C

Metal	Resistivity (μΩ • cm)
Silver (Ag)	1.6
Copper (Cu)	1.7
Gold (Au)	2.2
Aluminum (Al)	2.8
Tungsten (W)	5.3
Molybdenum (Mo)	5.3
Titanium (Ti)	43.0

Example for Model 1(conservative)

Table 4.8 Capacitance table for 180 nm process (aF/μm) with metal planes above and below

w	s	Metal1			Metal2			Metal3			Metal4			Metal5			Metal6		
		C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}
1	1	84	43	210	88	57	232	88	57	232	77	78	232	73	94	240	82	64	227
1	1.5	57	52	166	58	68	184	58	68	184	49	93	191	45	112	202	54	76	184
1	2	42	60	144	42	78	162	42	78	162	33	106	173	30	126	186	39	85	164
1	∞	0	112	112	0	132	132	0	132	132	0	154	154	0	167	167	0	137	137
1.5	1	85	53	224	89	70	248	89	70	248	77	99	253	73	119	266	83	80	246
1.5	1.5	58	62	178	59	82	199	59	82	199	49	114	212	45	137	227	56	91	202
1.5	2	43	70	156	42	92	177	42	92	177	34	127	194	30	151	211	41	101	182
1.5	∞	0	123	123	0	147	147	0	147	147	0	174	174	0	192	192	0	154	154
2	1	86	63	236	89	84	263	89	84	263	77	119	274	73	144	291	84	95	264
2	1.5	59	72	190	59	96	214	59	96	214	49	134	232	45	162	252	57	107	220
2	2	44	80	167	43	106	191	43	106	191	34	147	215	30	176	236	41	117	199
2	∞	0	134	134	0	162	162	0	162	162	0	195	195	0	217	217	0	171	171
3	1	87	83	258	90	113	292	90	113	292	77	160	315	73	194	341	86	127	298
3	1.5	60	92	211	59	124	243	59	124	243	49	175	273	45	212	302	58	138	254
3	2	44	101	189	43	135	220	43	135	220	34	188	256	30	226	286	42	148	233
3	∞	0	155	155	0	191	191	0	191	191	0	236	236	0	269	269	0	204	204
4	1	87	104	279	90	141	320	90	141	320	77	201	355	73	245	390	86	159	331
4	1.5	60	113	232	59	153	272	59	153	272	49	216	314	45	262	352	58	170	287
4	2	44	122	210	43	164	249	43	164	249	34	229	296	30	276	336	43	180	266
4	∞	0	176	176	0	219	219	0	219	219	0	278	278	0	321	321	0	237	237
6	1	87	146	320	89	199	377	89	199	377	77	284	437	72	345	490	86	223	396
6	1.5	59	155	274	59	210	328	59	210	328	49	299	396	45	362	451	58	235	351
6	2	44	163	252	42	221	306	42	221	306	33	312	378	30	376	436	43	245	331
6	∞	0	218	218	0	276	276	0	276	276	0	360	360	0	422	422	0	301	301

Por simplicidade,

λ= 180nm/2 = 90nm

Example for Model 2(optimistic)

Table 4.9 Capacitance table for 180 nm process (aF/μm) with substrate below and nothing above

w	s	Metal1			Metal2			Metal3			Metal4			Metal5			Metal6		
		C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}	C_{adj}	C_{gnd}	C_{tot}
1	1	89	28	206	101	19	220	96	16	208	102	15	219	96	15	208	97	14	207
1	1.5	63	33	159	73	22	167	70	18	158	75	17	166	70	17	158	71	15	158
1	2	49	37	136	58	24	140	57	20	133	60	18	138	57	19	132	58	17	132
1	∞	0	87	87	0	70	71	0	60	61	0	59	60	0	60	60	0	55	55
1.5	1	92	33	217	104	21	230	100	17	218	106	16	229	100	17	217	101	15	217
1.5	1.5	66	38	170	76	24	176	74	19	167	78	18	174	74	19	167	75	16	166
1.5	2	52	42	145	61	27	148	60	21	140	63	20	146	60	21	140	61	18	139
1.5	∞	0	94	94	0	75	75	0	64	64	0	62	62	0	63	63	0	58	58
2	1	94	38	227	107	24	238	103	19	225	110	18	237	103	18	225	104	16	224
2	1.5	68	43	178	78	26	183	76	21	174	81	19	181	77	20	173	78	17	173
2	2	53	47	154	63	29	154	62	22	147	66	21	152	62	22	146	63	19	145
2	∞	0	100	100	0	78	79	0	67	67	0	65	65	0	66	66	0	60	60
3	1	98	48	243	111	29	251	108	22	237	114	20	249	108	21	237	109	18	236
3	1.5	71	52	194	82	31	195	81	24	185	85	22	192	81	23	184	82	20	183
3	2	56	57	169	66	34	166	66	25	157	69	24	162	66	25	156	67	21	155
3	∞	0	112	112	0	86	86	0	72	72	0	69	70	0	71	72	0	64	65
4	1	100	58	257	114	33	262	111	25	247	118	23	258	111	24	246	112	20	245
4	1.5	73	62	208	85	36	205	83	27	194	88	25	201	83	26	193	85	22	192
4	2	58	67	182	68	38	175	68	28	165	72	26	171	68	28	165	70	23	163
4	∞	0	124	124	0	92	93	0	77	77	0	74	75	0	76	76	0	68	69
6	1	102	77	282	118	43	279	115	31	262	122	28	272	115	31	260	116	25	258
6	1.5	76	82	233	88	46	222	87	33	208	92	30	215	87	33	207	89	26	204
6	2	61	86	207	72	48	191	72	35	179	76	31	184	72	34	178	73	28	175
6	∞	0	147	147	0	105	105	0	86	86	0	82	83	0	85	85	0	75	76

Por simplicidade,

λ= 180nm/2 = 90nm

MOSIS Design Rules Listing

Table 3.2 MOSIS design rules (continued)

Layer	Rule	Description	SCMOS	SUBM	DEEP
Via1–Via(*N*-1)	8.1, 14.1, …	Width (exact)	2x2	2x2	3x3
	8.2, 14.2, …	Spacing to via on same layer	3	3	3
	8.4	Spacing to contacts (if no stacked vias)	2	2	n/a
	8.5	Spacing of via1 to poly or active edge	2	2	n/a
	14.4	Spacing of via2 to via1 (if no stacked vias)	2	2	n/a
Metal2–Metal(*N*-1)	9.1, …	Width	3	3	3
	9.2, …	Spacing to same layer metal	3	3	4
	9.3, …	Overlap of via	1	1	1
	9.4, …	Spacing to metal for lines wider than 10 λ	6	6	8
Metal3 (3-layer process)	15.1	Width	6	5	n/a
	15.2	Spacing to metal3	4	3	n/a
	15.3	Overlap of via2	2	2	n/a
	15.4	Spacing to metal for lines wider than 10 λ	8	6	n/a
Metal5 (5-layer process)	26.1	Width	n/a	4	4
	26.2	Spacing to metal5	n/a	4	4
	26.3	Overlap of via4	n/a	1	2
	26.4	Spacing to metal for lines wider than 10 λ	n/a	8	8
Metal6 (6-layer process)	30.1	Width	n/a	5	5
	30.2	Spacing to metal6	n/a	5	5
	30.3	Overlap of via5	n/a	1	2
	30.4	Spacing to metal for lines wider than 10 λ	n/a	10	10
Overglass Cut	10.1	Width of bond pad opening	60 µm		
	10.2	Width of probe pad opening	20 µm		
	10.3	Metal overlap of overglass cut	6 µm		
	10.4	Spacing of pad metal to unrelated metal	30 µm		
	10.5	Spacing of pad metal to active or poly	15 µm		