7.6.3 SHEET RESISTANCES

SHEET RESISTANCES - FRONT END						
Layer	**MIN (Ohm/sq)**	**TYP (Ohm/sq)**	**MAX (Ohm/sq)**	**TC1 (%/K)**	**TC2 (%/K)^2**	**Imax (mA/um) [a]**
Standard Process						
NWELL or NWELLGO2 under OD	250	500	650			
NWELL under Field Oxide	400	900	1200			
NWELL+NISO under Field Oxide	300	600	900			
NISO under PWELL under Field Oxide	500	800	1100			
PWELL or PWELLGO2 isolated by NISO under Field oxide	1500	2200	2600			
P-Substrate before back grind (775um, 15Ohm cm) w/ P- EPI (4um, 15Ohm cm)	140	192.5	245			
N+ silicided Source/Drain	7	12	17			
P+ silicided Source/Drain	7	15	20			
N+ Polycide on field oxide	7	12	17	0.23	0	1.640
P+ Polycide on field oxide	7	15	20			
Unsilicided P+ Source/Drain	200	250	300	0.145	9.3E-3	
Unsilicided N+ Source/Drain	90	130	170			
Unsilicided P+ poly	610	710	810	-0.036	6.8E-3	0.154
Unsilicided N+ poly	100	150	200	0.011	3.3E-3	0.478
Process Options						
HIPO resistor	4800	6000	7200			

a. Imax is the maximum current allowed prior to a temperature increase of 5C due to Joule self-heating.

SHEET RESISTANCES - BACK END [a]					
Layer (from bottom to top)	**MIN**	**TYP**	**MAX**		**TCR (%/K)**
M1~~(for w < 0.16)~~ (w = 0.090 um)	~~125~~125	~~180~~175	~~235~~225	mOhm/sq	0.30
M1~~(for w >= 0.16)~~ (w = 0.270 um)	~~95~~90	~~145~~134	~~195~~177	mOhm/sq	0.30
MiX~~(for w < 0.16)~~ (w = 0.100 um)	~~95~~90	~~145~~135	~~195~~180	mOhm/sq	0.32
MiX~~(for w >= 0.16)~~ (w = 0.300 um)	~~75~~76	~~115~~110	~~155~~143	mOhm/sq	0.32
MiY	31	41	51	mOhm/sq	0.32
MiZ	~~18~~ 19	~~23~~ 24	~~28~~ 29	mOhm/sq	0.35
AP	18	24	30	mOhm/sq	0.36

a.For width dependent modeling of M1 and MiX sheet resistances see §7.6.5.1

7.6.4 CONTACT RESISTANCES

CONTACT RESISTANCES				
Contact type	**MIN**	**TYP**	**MAX**	**UNIT**
CO “Kelvin” structures [a]				Ohm
CO N+ Active	30	70	120	Ohm
CO P+ Active	40	80	130	Ohm
CO Polycide N+	30	70	120	Ohm
CO Polycide P+	40	80	130	Ohm
VIAiX	~~0.5~~0.01	~~2.0~~1.0	~~4.0~~2.0	Ohm
VIAiY	0.3	1.0	5.0	Ohm
VIAiZ	0.1	0.5	1.0	Ohm
CB 3um x 3um	0.05	0.1	0.25	Ohm

a.for process monitoring only, “Kelvin Structure” resistance values are not to be used for design.

7.6.5 PARASITIC EXTRACTION - SPECIAL CONSIDERATIONS

7.6.5.1 Modeling of metal sheet resistances

The sheet resistance of Metal lines is modeled dependent on the metal line width:

$$rsh = a_0 + a_1 \cdot \log(w) + a_2 \cdot \log(w)^2 + a_3 \cdot \log(w)^3$$

rsh	sheet resistance [mOhm/sq]
w	line width [um]
a_0, a_1, a_2, a_3	model parameter [mOhm/sq]

METAL SHEET RESISTANCE - MODEL PARAMETER					
Metal Corner	**a_0**	**a_1**	**a_2**	**a_3**	**UNIT**
M1 min	100.61	45.16	25.66	-39.98	mOhm/sq
M1 typ	147.71	54.82	24.292	-53.185	mOhm/sq
M1 max	194.81	64.48	22.92	-66.49	mOhm/sq
MiX min	63.64	-18.79	8.21	-	mOhm/sq
MiX typ	91.59	-22.625	21.72	-	mOhm/sq
MiX max	119.54	-26.46	35.23	-	mOhm/sq
MiY min	31	-	-	-	mOhm/sq
MiY typ	41	-	-	-	mOhm/sq
MiY max	51	-	-	-	mOhm/sq
MiZ min	19	-	-	-	mOhm/sq
MiZ typ	24	-	-	-	mOhm/sq
MiZ max	29	-	-	-	mOhm/sq

7.6.5.2 Process corners

PARASITIC EXTRACTION - CORNER DEFINITIONS							
Corner	**Metal th [a]**	**Metal w [a]**	**VIA th [a]**	**k1/k2 [b]**	**VIA res [c]**	**Metal res [c]**	**Temp [c]**
TYP	typ	typ	typ	typ/typ	typ	typ	typ (25C)
RC min	min	min	max	min/min	min	min	typ (25C)
RC max	max	max	min	max/max	max	max	typ (25C)
C min	min	min	max	min/min	min	max	min (-40C)
C max	max	max	min	max/max	max	min	max (105C)
X-talk	max	max	max	max/min	min	min	min (-40C)
Delay	min	min	min	min/max	max	max	max (105C)

a.for capacitance calculation
b.k1 = intra-layer dielectric, k2 = inter-layer dielectric.
c.for resistance calculation

7.6.5.3 Sizing / retargetting of isolated features

Isolated narrow metal and poly lines have to be upsized to achieve manufacturability as described in the reference document RADCS # R009441.