



* BEGIN *

**65 nm Logic and Mixed-Mode Low Leakage Low-K
Process Electrical Design Rule**

(Ver. 1.7_P. 1)

P-Sub, Logic and Mixed-Mode Process

DSM NO. : G-02-LOGIC/MIXED_MODE65N-LL/LOW_K-EDR

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2. Revision History

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.7	1	03/13/2014	-	8.3 2.5V Operated at 1.8V MOSFET Device Electrical Parameters	New device

~revision history end~

3. Process Parameters

Note*1 Please refer to individual interconnect capacitance model (G-04 document in individual DSM) for precise interconnection capacitance extraction.

Note*2 For the version number of each device, please refer to the corresponding SPICE model (G-05) DSM.

Note*3 For Section4-10, if customer has static back-bias application, please contact UMC for HCI lifetime penalty discussion.

	Min	Typ.	Max.	Unit
3.1 Starting Material P-type (Epi wafer)	7	12	17	Ohm*cm

3.2 Inter-layer Dielectric Thickness

3.2.1 FEOL Layers

<u>Top</u>	<u>Bottom</u>				
Poly1	Diffusion (Gate Oxide)				
	@1.2V Electrical (*4)	25	26	27	Å
	@1.8V Electrical (*4)	36	39	42	Å
	@2.5V Electrical (*4)	59	62	65	Å
	@3.3V Electrical (*4)	69	72	75	Å
	Substrate (Field Oxide)	3.2	3.5	3.8	KÅ
Note*4	$T_{ox} = \epsilon_0 * \epsilon_{ox} * AREA / C_{ox}, \epsilon=3.9$				

3.2.2 BEOL layers

3.2.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal)

Metal1	Diffusion	4.23	4.70	5.17	KÅ
	Substrate	7.38	8.20	9.02	KÅ
	Poly1	3.33	3.70	4.07	KÅ
Metal2	Diffusion	7.29	8.10	8.91	KÅ
	Substrate	10.44	11.60	12.76	KÅ
	Poly1	6.39	7.10	7.81	KÅ
Metal3	Metal1	1.44	1.60	1.76	KÅ
	Diffusion	10.71	11.90	13.09	KÅ
	Substrate	13.86	15.40	16.94	KÅ
	Poly1	9.81	10.90	11.99	KÅ
	Metal1	4.86	5.40	5.94	KÅ
Metal4	Metal2	1.44	1.60	1.76	KÅ
	Diffusion	14.13	15.70	17.27	KÅ
	Substrate	17.28	19.20	21.12	KÅ
	Poly1	13.23	14.70	16.17	KÅ
	Metal1	8.28	9.20	10.12	KÅ
	Metal2	4.86	5.40	5.94	KÅ
	Metal3	1.44	1.60	1.76	KÅ
Metal5	Diffusion	17.55	19.50	21.45	KÅ
	Substrate	20.70	23.00	25.30	KÅ
	Poly1	16.65	18.50	20.35	KÅ
	Metal1	11.70	13.00	14.30	KÅ
	Metal2	8.28	9.20	10.12	KÅ
	Metal3	4.86	5.40	5.94	KÅ
	Metal4	1.44	1.60	1.76	KÅ
Metal6	Diffusion	20.97	23.30	25.63	KÅ
	Substrate	24.12	26.80	29.48	KÅ
	Poly1	20.07	22.30	24.53	KÅ
	Metal1	15.12	16.80	18.48	KÅ
	Metal2	11.70	13.00	14.30	KÅ
	Metal3	8.28	9.20	10.12	KÅ
	Metal4	4.86	5.40	5.94	KÅ
Metal7	Metal5	1.44	1.60	1.76	KÅ
	Diffusion	25.83	28.70	31.57	KÅ
	Substrate	28.98	32.20	35.42	KÅ
	Poly1	24.93	27.70	30.47	KÅ
	Metal1	19.98	22.20	24.42	KÅ
	Metal2	16.56	18.40	20.24	KÅ
	Metal3	13.14	14.60	16.06	KÅ
	Metal4	9.72	10.80	11.88	KÅ
	Metal5	6.30	7.00	7.70	KÅ
	Metal6	2.88	3.20	3.52	KÅ

Metal8	Diffusion	31.95	35.50	39.05	KÅ
	Substrate	35.10	39.00	42.90	KÅ
	Poly1	31.05	34.50	37.95	KÅ
	Metal1	26.10	29.00	31.90	KÅ
	Metal2	22.68	25.20	27.72	KÅ
	Metal3	19.26	21.40	23.54	KÅ
	Metal4	15.84	17.60	19.36	KÅ
	Metal5	12.42	13.80	15.18	KÅ
	Metal6	9.00	10.00	11.00	KÅ
	Metal7	2.88	3.20	3.52	KÅ
Metal9	Diffusion	40.73	45.25	49.78	KÅ
	Substrate	43.88	48.75	53.63	KÅ
	Poly1	39.83	44.25	48.68	KÅ
	Metal1	34.88	38.75	42.63	KÅ
	Metal2	31.46	34.95	38.45	KÅ
	Metal3	28.04	31.15	34.27	KÅ
	Metal4	24.62	27.35	30.09	KÅ
	Metal5	21.20	23.55	25.91	KÅ
	Metal6	17.78	19.75	21.73	KÅ
	Metal7	11.66	12.95	14.25	KÅ
Metal10	Metal8	5.54	6.15	6.77	KÅ
	Diffusion	53.46	59.40	65.34	KÅ
	Substrate	56.61	62.90	69.19	KÅ
	Poly1	52.56	58.40	64.24	KÅ
	Metal1	47.61	52.90	58.19	KÅ
	Metal2	44.19	49.10	54.01	KÅ
	Metal3	40.77	45.30	49.83	KÅ
	Metal4	37.35	41.50	45.65	KÅ
	Metal5	33.93	37.70	41.47	KÅ
	Metal6	30.51	33.90	37.29	KÅ
AL-RDL(L2)	Metal7	24.39	27.10	29.81	KÅ
	Metal8	18.27	20.30	22.33	KÅ
	Metal9	5.54	6.15	6.77	KÅ
	Diffusion	72.09	80.10	88.11	KÅ
	Substrate	75.24	83.60	91.96	KÅ
	Poly1	71.19	79.10	87.01	KÅ
	Metal1	66.24	73.60	80.96	KÅ
	Metal2	62.82	69.80	76.78	KÅ
	Metal3	59.40	66.00	72.60	KÅ
	Metal4	55.98	62.20	68.42	KÅ
	Metal5	52.56	58.40	64.24	KÅ
	Metal6	49.14	54.60	60.06	KÅ
	Metal7	43.02	47.80	52.58	KÅ
	Metal8	36.90	41.00	45.10	KÅ
	Metal9	24.17	26.85	29.54	KÅ
	Metal10	11.43	12.70	13.97	KÅ
	Passivation Thickness(PSG/PESiN)	3.6/4.5	4.0/5.0	4.4/5.5	KÅ
Cu-Pad	Passivation Thickness	8.7	9.7	10.7	KÅ

3.2.2.2 Option 1: 1P10M (1x,2x, 6x Metal)

Metal1	Diffusion	4.23	4.70	5.17	KÅ
	Substrate	7.38	8.20	9.02	KÅ
	Poly1	3.33	3.70	4.07	KÅ
Metal2	Diffusion	7.29	8.10	8.91	KÅ
	Substrate	10.44	11.60	12.76	KÅ
	Poly1	6.39	7.10	7.81	KÅ
	Metal1	1.44	1.60	1.76	KÅ
Metal3	Diffusion	10.71	11.90	13.09	KÅ
	Substrate	13.86	15.40	16.94	KÅ
	Poly1	9.81	10.90	11.99	KÅ
	Metal1	4.86	5.40	5.94	KÅ
	Metal2	1.44	1.60	1.76	KÅ
Metal4	Diffusion	14.13	15.70	17.27	KÅ
	Substrate	17.28	19.20	21.12	KÅ
	Poly1	13.23	14.70	16.17	KÅ
	Metal1	8.28	9.20	10.12	KÅ
	Metal2	4.86	5.40	5.94	KÅ
	Metal3	1.44	1.60	1.76	KÅ
Metal5	Diffusion	17.55	19.50	21.45	KÅ
	Substrate	20.70	23.00	25.30	KÅ
	Poly1	16.65	18.50	20.35	KÅ
	Metal1	11.70	13.00	14.30	KÅ
	Metal2	8.28	9.20	10.12	KÅ
	Metal3	4.86	5.40	5.94	KÅ
	Metal4	1.44	1.60	1.76	KÅ
Metal6	Diffusion	20.97	23.30	25.63	KÅ
	Substrate	24.12	26.80	29.48	KÅ
	Poly1	20.07	22.30	24.53	KÅ
	Metal1	15.12	16.80	18.48	KÅ
	Metal2	11.70	13.00	14.30	KÅ
	Metal3	8.28	9.20	10.12	KÅ
	Metal4	4.86	5.40	5.94	KÅ
	Metal5	1.44	1.60	1.76	KÅ
Metal7	Diffusion	25.83	28.70	31.57	KÅ
	Substrate	28.98	32.20	35.42	KÅ
	Poly1	24.93	27.70	30.47	KÅ
	Metal1	19.98	22.20	24.42	KÅ
	Metal2	16.56	18.40	20.24	KÅ
	Metal3	13.14	14.60	16.06	KÅ
	Metal4	9.72	10.80	11.88	KÅ
	Metal5	6.30	7.00	7.70	KÅ
	Metal6	2.88	3.20	3.52	KÅ

Metal8	Diffusion	31.95	35.50	39.05	KÅ
	Substrate	35.10	39.00	42.90	KÅ
	Poly1	31.05	34.50	37.95	KÅ
	Metal1	26.10	29.00	31.90	KÅ
	Metal2	22.68	25.20	27.72	KÅ
	Metal3	19.26	21.40	23.54	KÅ
	Metal4	15.84	17.60	19.36	KÅ
	Metal5	12.42	13.80	15.18	KÅ
	Metal6	9.00	10.00	11.00	KÅ
	Metal7	2.88	3.20	3.52	KÅ
Metal9	Diffusion	40.73	45.25	49.78	KÅ
	Substrate	43.88	48.75	53.63	KÅ
	Poly1	39.83	44.25	48.68	KÅ
	Metal1	34.88	38.75	42.63	KÅ
	Metal2	31.46	34.95	38.45	KÅ
	Metal3	28.04	31.15	34.27	KÅ
	Metal4	24.62	27.35	30.09	KÅ
	Metal5	21.20	23.55	25.91	KÅ
	Metal6	17.78	19.75	21.73	KÅ
	Metal7	11.66	12.95	14.25	KÅ
Metal10	Diffusion	57.51	63.90	70.29	KÅ
	Substrate	60.66	67.40	74.14	KÅ
	Poly1	56.61	62.90	69.19	KÅ
	Metal1	51.66	57.40	63.14	KÅ
	Metal2	48.24	53.60	58.96	KÅ
	Metal3	44.82	49.80	54.78	KÅ
	Metal4	41.40	46.00	50.60	KÅ
	Metal5	37.98	42.20	46.42	KÅ
	Metal6	34.56	38.40	42.24	KÅ
	Metal7	28.44	31.60	34.76	KÅ
AL-RDL(L2)	Metal8	22.32	24.80	27.28	KÅ
	Metal9	5.54	6.15	6.77	KÅ
	Diffusion	80.19	89.10	98.01	KÅ
	Substrate	83.34	92.60	101.86	KÅ
	Poly1	79.29	88.10	96.91	KÅ
	Metal1	74.34	82.60	90.86	KÅ
	Metal2	70.92	78.80	86.68	KÅ
	Metal3	67.50	75.00	82.50	KÅ
	Metal4	64.08	71.20	78.32	KÅ
	Metal5	60.66	67.40	74.14	KÅ
Passivation Thickness(PSG/PESiN)	Metal6	57.24	63.60	69.96	KÅ
	Metal7	51.12	56.80	62.48	KÅ
	Metal8	45.00	50.00	55.00	KÅ
	Metal9	28.22	31.35	34.49	KÅ
	Metal10	11.43	12.70	13.97	KÅ
	Passivation Thickness(PSG/PESiN)	3.6/4.5	4.0/5.0	4.4/5.5	KÅ

3.2.3 Inter-layer Dielectric Thickness for MIMCAP (Metal Insulator Metal Capacitor)

<u>Top</u>	<u>Bottom</u>				
MIMBP	Metal 7	0.84	1.05	1.26	KÅ
MIMTP	Metal 7	1.98	2.48	2.97	KÅ
	MIMBP	0.264	0.330	0.396	KÅ
Metal 8	Metal 7	4.76	5.95	7.14	KÅ
	MIMBP	3.04	3.80	4.56	KÅ
	MIMTP	2.29	2.87	3.44	KÅ

3.3 Junction Depth

N-Well	--	1.5	--	um
N+ Diffusion for 1.2V device	--	0.1	--	um
P+ Diffusion for 1.2V device	--	0.1	--	um
N+ Diffusion for 1.8V device	--	0.1	--	um
P+ Diffusion for 1.8V device	--	0.1	--	um
N+ Diffusion for 2.5V device	--	0.1	--	um
P+ Diffusion for 2.5V device	--	0.1	--	um
N+ Diffusion for 3.3V device	--	0.1	--	um
P+ Diffusion for 3.3V device	--	0.1	--	um

3.4 Interconnect Thickness**3.4.1 FEOL Layers**

Poly1	0.90	1.00	1.10	KÅ
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3.4.2 BEOL layers**3.4.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal)**

Metal1	1.53	1.80	2.07	KÅ
Metal2	1.87	2.20	2.53	KÅ
Metal3	1.87	2.20	2.53	KÅ
Metal4	1.87	2.20	2.53	KÅ
Metal5	1.87	2.20	2.53	KÅ
Metal6	1.87	2.20	2.53	KÅ
Metal7	3.06	3.60	4.14	KÅ
MIMTP	0.51	0.60	0.69	KÅ
MIMBP	0.94	1.10	1.27	KÅ
Metal8	3.06	3.60	4.14	KÅ
Metal9	6.80	8.00	9.20	KÅ
Metal10	6.80	8.00	9.20	KÅ
Metal10 (for 32.5KÅ thickness)	27.6	32.5	37.4	KÅ
AL-RDL(L2) (for 12KÅ thickness)	10.2	12.0	13.8	KÅ
AL-RDL(L2) (for 25KÅ thickness)	20.8	25.0	29.2	KÅ
AL-RDL(L2) (for 36KÅ thickness)	30.0	36.0	42.0	KÅ

3.4.2.2 Option 1: 1P10M (1x,2x, 6x Metal)

Metal1	1.53	1.80	2.07	KÅ
Metal2	1.87	2.20	2.53	KÅ
Metal3	1.87	2.20	2.53	KÅ
Metal4	1.87	2.20	2.53	KÅ
Metal5	1.87	2.20	2.53	KÅ
Metal6	1.87	2.20	2.53	KÅ
Metal7	3.06	3.60	4.14	KÅ
Metal8	3.06	3.60	4.14	KÅ
Metal9	10.63	12.50	14.38	KÅ
Metal10	10.63	12.50	14.38	KÅ
AL-RDL(L2) (for 12KÅ thickness)	10.2	12.0	13.8	KÅ
AL-RDL(L2) (for 25KÅ thickness)	20.8	25.0	29.2	KÅ
AL-RDL(L2) (for 36KÅ thickness)	30.0	36.0	42.0	KÅ

4. Low Leakage Device with High Threshold Voltage Option (LL_HVT) Electrical Parameters**4.1 1.2V NFET Electrical Parameters, in P-Sub**

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=1.2V, VB=0V)	25	26	27	Å
Tox_gl (@VG=-2V, VB=0V) (*5)	18.5	19.5	20.5	Å
Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) (*6)	0.585	0.66	0.725	V
Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD= 1.2V)	0.434	0.51	0.575	V
Ion (W/L=1/0.06, @VD=VG= 1.2V)	364	445	535	uA/um
Ioff (W/L=1/0.06, @VD= 1.2 V, VG= 0 V)	--	16	122	pA/um
Ioff (W/L=1/0.06, @VD= 1.2 V, VG= 0V, T=85°C ³)	--	290	1632	pA/um
Isub (W/L=1/0.06; Maximum)	--	-10	--	nA/um
Vt-shift (Body Effect, W/L=1/0.06 @VB= 0, -1.2 V, VD= 0.05V)	0.035	0.11	0.175	V
Subthreshold Swing (W/L=1/0.06, @VD= 1.2 V, VB= 0V)	75.1	88.3	101.6	mV/dec
Jg_inv (W/L=5/5, 25fingers, @VG=1.2V, VD, VS grounded)	0.028	0.067	0.160	A/cm ²
Ij (Vj=1.2V, T=25°C)	--	--	10	fA/um ²

4.2 1.2V PFET Electrical Parameters, in N-Well

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=-1.2V, VB=0V)	26.5	27.5	28.5	Å
Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V)	-0.531	-0.6	-0.658	V
Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V)	-0.421	-0.49	-0.549	V
Ion (W/L=1/0.06, @VD=VG=-1.2V)	-173	-210	-252	uA/um
Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V)	--	-10	-52	pA/um
Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C)	--	-180	-811	pA/um
Isub (W/L=1/0.06; Maximum)	--	51	--	pA/um
Vt-shift (Body Effect, W/L=1/0.06 @VB= 0, 1.2V, VD=-0.05V)	-0.145	-0.203	-0.272	V
Subthreshold Swing (W/L=1/0.06, @VD=-1.2V, VB=0V)	80.8	95.1	109.4	mV/dec
Jg_inv (W/L=5/5, 25fingers, @VG=-1.2V, VD, VS grounded)	-0.0024	-0.0058	-0.0142	A/cm ²
Ij (Vj=-1.2V, T=25°C)	--	--	-10	fA/um ²

4.3 Gate Delay

Delay Time (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V)	12.4	15.1	18.8	pSec/stage
--	------	------	------	------------

Note*5 Tox_gl = -2.25*(log(J)-7.101), where J (A/cm²) is the gate oxide leakage current.

Note*6 The threshold voltage is defined as gate to source bias at which |ID|= 300nA*W/L for NFET and |ID|=70nA*W/L for PFET, where L=L_TEM.

Note*7 Except separately specified, the electrical parameters are given for T= 25°C.

5. Low Leakage Device with Regular Threshold Voltage Option (LL_RVT) Electrical Parameters

5.1 1.2V NFET Electrical Parameters, in P-Sub

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=1.2V, VB=0V)	25	26	27	Å
Tox_gl (@VG=-2V, VB=0V)	18.5	19.5	20.5	Å
Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V)	0.46	0.525	0.586	V
Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD=1.2V)	0.296	0.37	0.435	V
Ion (W/L=1/0.06, @VD=VG=1.2V)	516	630	756	uA/um
Ioff (W/L=1/0.06, @VD=1.2V, VG=0V)	--	500	7290	pA/um
Ioff (W/L=1/0.06, @VD=1.2V, VG=0V, T=85°C)	--	3.68	30	nA/um
Isub(W/L=1/0.06, Maximum)	--	-15	--	nA/um
Vt-shift (Body Effect, W/L=1/0.06 @VB=0, -1.2V, VD=0.05V)	0.01	0.07	0.131	V
Subthreshold Swing (W/L=1/0.06, @VD=1.2V, VB=0V)	72.3	85.0	97.8	mV/dec
Jg_inv (W/L=5/5, 25fingers, @VG=1.2V, VD, VS grounded)	0.0296	0.0729	0.181	A/cm ²
Ij (Vj=1.2V, T=25°C)	--	--	10	fA/um ²

5.2 1.2V PFET Electrical Parameters, in N-Well

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=-1.2V, VB=0V)	26.5	27.5	28.5	Å
Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V)	-0.445	-0.49	-0.539	V
Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V)	-0.301	-0.36	-0.427	V
Ion (W/L=1/0.06, @VD=VG=-1.2V)	-253	-310	-370	uA/um
Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V)	--	-200	-1870	pA/um
Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C)	--	-2.8	-16.6	nA/um
Isub (W/L=1/0.06; Maximum)	--	65	--	pA/um
Vt-shift (Body Effect, W/L=1/0.06 @VB=0, 1.2V, VD=-0.05V)	-0.087	-0.136	-0.181	V
Subthreshold Swing (W/L=1/0.06, @VD=-1.2V, VB=0V)	78.9	92.8	106.7	mV/dec
Jg_inv (W/L=5/5, 25fingers, @VG=-1.2V, VD, VS grounded)	-0.0023	-0.0057	-0.015	A/cm ²
Ij (Vj=-1.2V, T=25°C)	--	--	-10	fA/um ²

5.3 Gate Delay

Delay Time (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V)	8.2	9.8	11.7	pSec/stage
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6. Low Leakage Device with Low Threshold Voltage Option (LL_LVT) Electrical Parameters**6.1 1.2V NFET Electrical Parameters, in P-Sub**

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=1.2V, VB=0V)	25	26	27	Å
Tox_gl (@VG=-2V, VB=0V)	18.5	19.5	20.5	Å
Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V)	0.375	0.450	0.516	V
Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD=1.2V)	0.205	0.280	0.345	V
Ion (W/L=1/0.06, @VD=VG=1.2V)	583	730	876	uA/um
Ioff (W/L=1/0.06, @VD=1.2V, VG=0V)	--	5	53	nA/um
Ioff (W/L=1/0.06, @VD=1.2V, VG=0V, T=85°C)	--	34	194	nA/um
Isub(W/L=1/0.06, Maximum)	--	-18	--	nA/um
Vt-shift (Body Effect, W/L=1/0.06 @VB=0, -1.2V, VD=0.05V)	0.01	0.049	0.115	V
Subthreshold Swing (W/L=1/0.06, @VD=1.2V, VB=0V)	71.4	84.0	96.6	mV/dec
Jg_inv (W/L=5/5, 25fingers, @VG=1.2V, VD, VS grounded)	0.0296	0.0729	0.181	A/cm ²
Ij (Vj=1V, T=25°C)	--	--	10	fA/um ²

6.2 1.2V PFET Electrical Parameters, in N-Well

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=-1.2V, VB=0V)	26.5	27.5	28.5	Å
Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V)	-0.365	-0.43	-0.492	V
Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V)	-0.225	-0.29	-0.35	V
Ion (W/L=1/0.06, @VD=VG=-1.2V)	-295	-365	-438	uA/um
Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V)	--	-1.5	-13.8	nA/um
Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C)	--	-12.9	-69	nA/um
Isub (W/L=1/0.06; Maximum)	--	72	--	pA/um
Vt-shift (Body Effect, W/L=1/0.06 @VB=0, 1.2V, VD=-0.05V)	-0.018	-0.08	-0.145	V
Subthreshold Swing (W/L=1/0.06, @VD=-1.2V, VB=0V)	80.6	94.9	109.1	mV/dec
Jg_inv (W/L=5/5, 25fingers, @VG=-1.2V, VD, VS grounded)	-0.0023	-0.0057	-0.015	A/cm ²
Ij (Vj=-1.2V, T=25°C)	--	--	-10	fA/um ²

6.3 Gate Delay

Delay Time (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V)	6.8	8.1	10.0	pSec/stage
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7. 1.8V MOSFET Electrical Parameters

7.1 1.8V NFET Electrical Parameters, in P-Sub

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=1.8V, VB=0V)	36	39	42	Å
Vtlin (W/L=10/0.18, @ID=300nA*W/L, VD=0.05V)	0.464	0.535	0.607	V
Vtsat (W/L=10/0.18, @ID=300nA*W/L, VD=1.8V)	0.397	0.47	0.546	V
Ion (W/L=10/0.18, @VD=VG=1.8V)	507	600	694	uA/um
Ioff (W/L=10/0.18, @VD=1.8V, VG=0V)	--	5	37	pA/um
Ioff (W/L=10/0.18, @VD=1.8V, VG=0V, T=85°C)	--	109	591	pA/um
Isub (W/L=10/0.18; Maximum)	--	-123	--	nA/um
Vt-shift (Body Effect, W/L=10/0.18 @VB=0, -1.8V, VD=0.05V)	0.184	0.254	0.327	V
Subthreshold Swing (W/L=10/0.18, @VD=1.8V, VB=0V)	68.6	80.7	92.8	mV/dec
Vbd_ox (IG=10uA/um ²)	4.1	--	--	V
Vbd (W/L=10/0.18, @ID=1uA/um)	4.0	--	--	V
Ij (Vj=1.8V, T=25°C)	--	--	10	fA/um ²

7.2 1.8V PFET Electrical Parameters, in N-Well

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=-1.8V, VB=0V)	37.5	40.5	43.5	Å
Vtlin (W/L=10/0.18, @ID=-70nA*W/L, VD=-0.05V)	-0.376	-0.425	-0.485	V
Vtsat (W/L=10/0.18, @ID=-70nA*W/L, VD=-1.8V)	-0.34	-0.385	-0.443	V
Ion (W/L=10/0.18, @VD=VG=-1.8V)	-215	-255	-294	uA/um
Ioff (W/L=10/0.18, @VD=-1.8V, VG=0V)	--	-10	-26	pA/um
Ioff (W/L=10/0.18, @VD=-1.8V, VG=0V, T=85°C)	--	-221	-484	pA/um
Isub (W/L=10/0.18; Maximum)	--	1	--	nA/um
Vt-shift (Body Effect, W/L=10/0.18 @VB=0, 1.8V, VD=-0.05V)	-0.339	-0.40	-0.448	V
Subthreshold Swing (W/L=10/0.18, @VD=-1.8V, VB=0V)	68.0	80.0	92.0	mV/dec
Vbd_ox (IG=-10uA/um ²)	-6.0	--	--	V
Vbd (W/L=10/0.18, @ID=-1uA/um)	-3.9	--	--	V
Ij (Vj=-1.8V, T=25°C)	--	--	-10	fA/um ²

7.3 Gate Delay

Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.18um, PFET W/L=2*3um/0.18um, @ 1.8V)	17.1	19.6	23.1	pSec/stage
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8. 2.5V MOSFET Electrical Parameters

8.1 2.5V Device Electrical Parameters

8.1.1 2.5V NFET Electrical Parameters, in P-Sub

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=2.5V, VB=0V)	59	62	65	Å
Vtlin (W/L=10/0.24, @ID=300nA*W/L, VD=0.05V)	0.493	0.58	0.659	V
Vtsat (W/L=10/0.24, @ID=300nA*W/L, VD=2.5V)	0.351	0.44	0.521	V
Ion (W/L=10/0.24, @VD=VG=2.5V)	522	600	690	uA/um
Ioff (W/L=10/0.24, @VD=2.5V, VG=0V)	--	10	161	pA/um
Ioff (W/L=10/0.24, @VD=2.5V, VG=0V, T=85°C)	--	211	2130	pA/um
Isub (W/L=10/0.24; Maximum)	--	-782	--	nA/um
Vt-shift (Body Effect, W/L=10/0.24 @VB=0, -2.5V, VD=0.05V)	0.174	0.26	0.34	V
Subthreshold Swing (W/L=10/0.24, @VD=2.5V, VB=0V)	67.3	79.1	91.0	mV/dec
Vbd_ox (IG=10uA/um ²)	7.1	--	--	V
Vbd (W/L=10/0.24, @ID=1uA/um)	8.1	--	--	V
Ij (Vj=2.5V, T=25°C)	--	--	10	fA/um ²

8.1.2 2.5V PFET Electrical Parameters, in N-Well

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=-2.5V, VB=0V)	61.2	64.2	67.2	Å
Vtlin (W/L=10/0.24, @ID=-70nA*W/L, VD=-0.05V)	-0.445	-0.53	-0.615	V
Vtsat (W/L=10/0.24, @ID=-70nA*W/L, VD=-2.5V)	-0.381	-0.475	-0.551	V
Ion (W/L=10/0.24, @VD=VG=-2.5V)	-240	-275	-316	uA/um
Ioff (W/L=10/0.24, @VD=-2.5V, VG=0V)	--	-3.0	-35	pA/um
Ioff (W/L=10/0.24, @VD=-2.5V, VG=0V, T=85°C)	--	-52	-404	pA/um
Isub (W/L=10/0.24; Maximum)	--	24	--	nA/um
Vt-shift (Body Effect, W/L=10/0.24 @VB=0, 2.5V, VD=-0.05V)	-0.541	-0.62	-0.711	V
Subthreshold Swing (W/L=10/0.24, @VD=-2.5V, VB=0V)	75.3	88.6	101.8	mV/dec
Vbd_ox (IG=-10uA/um ²)	-9.5	--	--	V
Vbd (W/L=10/0.24, @ID=-1uA/um)	-5.2	--	--	V
Ij (Vj=-2.5V, T=25°C)	--	--	-10	fA/um ²

8.1.3 Gate Delay

Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.24um, PFET W/L=2*3um/0.24um, @ 2.5V)	21.1	23.3	25.8	pSec/stage
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8.2 2.5V Operated at 3.3V MOSFET Device Electrical Parameters

8.2.1 2.5V Operated at 3.3V NFET Electrical Parameters, in P-Sub

	Min.	Typ.	Max.	Unit
Vtlin (W/L=10/0.5, @ID=300nA*W/L, VD=0.05V)	0.578	0.649	0.712	V
Vtsat (W/L=10/0.5, @ID=300nA*W/L, VD=3.3V)	0.525	0.595	0.658	V
Ion (W/L=10/0.5, @VD=VG=3.3V)	482	540	599	uA/um
Ioff (W/L=10/0.5, @VD=3.3V, VG=0V)	--	0.4	1	pA/um

8.2.2 2.5V Operated at 3.3V PFET Electrical Parameters, in N-Well

	Min.	Typ.	Max.	Unit
Vtlin (W/L=10/0.4, @ID=-70nA*W/L, VD=-0.05V)	-0.495	-0.572	-0.638	V
Vtsat (W/L=10/0.4, @ID=-70nA*W/L, VD=-3.3V)	-0.454	-0.53	-0.596	V
Ion (W/L=10/0.4, @VD=VG=-3.3V)	-245	-272	-300	uA/um
Ioff (W/L=10/0.4, @VD=-3.3V, VG=0V)	--	-22	-53.5	pA/um

8.2.3 Gate Delay

Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.5um, PFET W/L=2*3um/0.4um, @ 3.3V)	45.0	47.8	51.2	pSec/stage
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8.3 2.5V Operated at 1.8V MOSFET Device Electrical Parameters	Min.	Typ.	Max.	Unit
8.3.1 2.5V Operated at 1.8V NFET Electrical Parameters, in P-Sub				
<i>V_{tlin} (W/L=10/0.22, @ID=300nA*W/L, VD=0.05V)</i>	<i>0.456</i>	<i>0.546</i>	<i>0.629</i>	<i>V</i>
<i>V_{tsat} (W/L=10/0.22, @ID=300nA*W/L, VD=1.8)</i>	<i>0.315</i>	<i>0.409</i>	<i>0.494</i>	<i>V</i>
<i>I_{on} (W/L=10/0.22, @VD=VG=1.8)</i>	<i>325</i>	<i>385.91</i>	<i>456</i>	<i>uA/um</i>
<i>I_{off} (W/L=10/0.22, @VD=1.8, VG=0V)</i>	<i>1.35</i>	<i>28.0</i>	<i>547</i>	<i>pA/um</i>
8.3.2 2.5V Operated at 1.8V PFET Electrical Parameters, in N-Well				
<i>V_{tlin} (W/L=10/0.22, @ID=-70nA*W/L, VD=-0.05V)</i>	<i>-0.423</i>	<i>-0.518</i>	<i>-0.601</i>	<i>V</i>
<i>V_{tsat} (W/L=10/0.22, @ID=-70nA*W/L, VD=-1.8V)</i>	<i>-0.361</i>	<i>-0.456</i>	<i>-0.539</i>	<i>V</i>
<i>I_{on} (W/L=10/0.22, @VD=VG=-1.8V)</i>	<i>-135</i>	<i>-161.62</i>	<i>-194</i>	<i>uA/um</i>
<i>I_{off} (W/L=10/0.22, @VD=-1.8V, VG=0V)</i>	<i>-0.21</i>	<i>-4.1</i>	<i>-55.1</i>	<i>pA/um</i>
8.3.3 Gate Delay				
<i>Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.5um, PFET W/L=2*3um/0.4um, @ 1.8V)</i>	<i>24.0</i>	<i>28.0</i>	<i>32.5</i>	<i>pSec/stage</i>

9. 3.3V MOSFET Electrical Parameters

9.1 3.3V NFET Electrical Parameters, in P-Sub

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=3.3V, VB=0V)	69	72	75	Å
Vtlin (W/L=10/0.37, @ID=300nA*W/L, VD=0.05V)	0.471	0.56	0.640	V
Vtsat (W/L=10/0.37, @ID=300nA*W/L, VD=3.3V)	0.40	0.49	0.57	V
Ion (W/L=10/0.37, @VD=VG=3.3V)	514	590	678	uA/um
Ioff (W/L=10/0.37, @VD=3.3V, VG=0V)	--	1	15.4	pA/um
Ioff (W/L=10/0.37, @VD=3.3V, VG=0V, T=85°C)	--	220	726	pA/um
Isub (W/L=10/0.37; Maximum)	--	-2.73	--	uA/um
Vt-shift (Body Effect, W/L=10/0.37, @VB=0, -3.3V, VD=0.05V)	0.397	0.5	0.591	V
Subthreshold Swing (W/L=10/0.37, @VD=3.3V, VB=0V)	61.6	72.4	83.3	mV/dec
Vbd_ox (IG=10uA/um ²)	8.2	--	--	V
Vbd (W/L=10/0.37, @ID=1uA/um)	7.7	--	--	V
Ij (Vj=3.3V, T=25°C)	--	--	10	fA/um ²

9.2 3.3V PFET Electrical Parameters, in N-Well

	Min.	Typ.	Max.	Unit
Tox_inv (@100kHz, VG=-3.3V, VB=0V)	71	74	77	Å
Vtlin (W/L=10/0.37, @ID=-70nA*W/L, VD=-0.05V)	-0.534	-0.625	-0.706	V
Vtsat (W/L=10/0.37, @ID=-70nA*W/L, VD=-3.3V)	-0.50	-0.59	-0.67	V
Ion (W/L=10/0.37, @VD=VG=-3.3V)	-225	-260	-299	uA/um
Ioff (W/L=10/0.37, @VD=-3.3V, VG=0V)	--	-1	-11	pA/um
Ioff (W/L=10/0.37, @VD=-3.3V, VG=0V, T=85°C)	--	-4.1	-30.5	pA/um
Isub (W/L=10/0.37; Maximum)	--	185	--	nA/um
Vt-shift (Body Effect, W/L=10/0.37 @VB=0, 3.3V, VD=-0.05V)	-0.825	-0.91	-1.006	V
Subthreshold Swing (W/L=10/0.37, @VD=-3.3V, VB=0V)	77.0	90.6	104.2	mV/dec
Vbd_ox (IG=-10uA/um ²)	-11.0	--	--	V
Vbd (W/L=10/0.37, @ID=-1uA/um)	-6.5	--	--	V
Ij (Vj=-3.3V, T=25°C)	--	--	-10	fA/um ²

9.3 Gate Delay

Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.37um, PFET W/L=2*3um/0.37um, @ 3.3V)	31.0	35.0	39.7	pSec/stage
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10. Native NFET Electrical parameters**10.1 1.2V Thin Oxide Native NFET in P-Sub**

	Min.	Typ.	Max.	Unit
Vtlin (W/L=1/0.2, @ID=300nA*W/L, VD=0.05V)	0.035	0.11	0.183	V
Vtsat (W/L=1/0.2, @ID=300nA*W/L, VD=1.2V)	-0.032	0.042	0.112	V
Ion (W/L=1/0.2, @VD=VG=1.2V)	535	667	798	uA/um

10.2 1.8V Thick Oxide Native NFET in P-Sub

Vtlin (W/L=10/1, @ID=300nA*W/L, VD=0.05V)	-0.099	-0.18	-0.264	V
Vtsat (W/L=10/1, @ID=300nA*W/L, VD=1.8V)	-0.158	-0.244	-0.33	V
Ion (W/L=10/1, @VD=VG=1.8V)	364.0	436.9	510.3	uA/um

10.3 2.5V Thick Oxide Native NFET in P-Sub

Vtlin (W/L=10/1.2, @ID=300nA*W/L, VD=0.05V)	-0.045	-0.156	-0.264	V
Vtsat (W/L=10/1.2, @ID=300nA*W/L, VD=2.5V)	-0.129	-0.24	-0.343	V
Ion (W/L=10/1.2, @VD=VG=2.5V)	345	431.5	515	uA/um

10.4 2.5VOD3.3V Thick Oxide Native NFET in P-Sub

Vtlin (W/L=10/1.4, @ID=300nA*W/L, VD=0.05V)	-0.048	-0.153	-0.257	V
Vtsat (W/L=10/1.4, @ID=300nA*W/L, VD=3.3V)	-0.126	-0.228	-0.329	V
Ion (W/L=10/1.4, @VD=VG=3.3V)	441.6	533.4	622.6	uA/um

10.5 3.3V Thick Oxide Native NFET in P-Sub

Vtlin (W/L=10/1.2, @ID=300nA*W/L, VD=0.05V)	-0.029	-0.16	-0.291	V
Vtsat (W/L=10/1.2, @ID=300nA*W/L, VD=3.3V)	-0.135	-0.266	-0.391	V
Ion (W/L=10/1.2, @VD=VG=3.3V)	421	525.2	631	uA/um

10.6 1.2V Thin Oxide Native NFET in Deep NWell

Vtlin (W/L=1/0.2, @ID=300nA*W/L, VD=0.05V)	0.073	0.148	0.222	V
Vtsat (W/L=1/0.2, @ID=300nA*W/L, VD=1.2V)	0.028	0.101	0.172	V
Ion (W/L=1/0.2, @VD=VG=1.2V)	491	615	737	uA/um

10.7 1.8V Thick Oxide Native NFET in Deep NWell

Vtlin (W/L=10/1, @ID=300nA*W/L, VD=0.05V)	-0.074	-0.010	0.053	V
Vtsat (W/L=10/1, @ID=300nA*W/L, VD=1.8V)	-0.090	-0.027	0.035	V
Ion (W/L=10/1, @VD=VG=1.8V)	314	367	420	uA/um

10.8 2.5V Thick Oxide Native NFET in Deep NWell

Vtlin (W/L=10/1.2, @ID=300nA*W/L, VD=0.05V)	-0.049	0.044	0.137	V
Vtsat (W/L=10/1.2, @ID=300nA*W/L, VD=2.5V)	-0.066	0.026	0.118	V
Ion (W/L=10/1.2, @VD=VG=2.5V)	299	359	419	uA/um

10.9 2.5VOD3.3V Thick Oxide Native NFET in Deep NWell

Vtlin (W/L=10/1.2, @ID=300nA*W/L, VD=0.05V)	-0.049	0.044	0.136	V
Vtsat (W/L=10/1.2, @ID=300nA*W/L, VD=3.3V)	-0.070	0.022	0.113	V
Ion (W/L=10/1.2, @VD=VG=3.3V)	423	503	578	uA/um

10.10 3.3V Thick Oxide Native NFET in Deep NWell

Vtlin (W/L=10/1.2, @ID=300nA*W/L, VD=0.05V)	-0.016	0.090	0.199	V
Vtsat (W/L=10/1.2, @ID=300nA*W/L, VD=3.3V)	-0.036	0.068	0.174	V
Ion (W/L=10/1.2, @VD=VG=3.3V)	350	436	527	uA/um

11. Resistance

11.1 Salicide and Metal Resistances

11.1.1 Sheet resistance of Salicide and Metal

11.1.1.1 FEOL Layers

	Min.	Typ.	Max.	Unit
N+ sheet resistance (W= 0.08 um)	4	11	20	Ohm/sq
P+ sheet resistance (W= 0.08 um)	3	9	20	Ohm/sq
N+ sheet resistance between two Poly lines (S= 0.13 um)	9	32	55	Ohm/sq
P+ sheet resistance between two Poly lines (S= 0.13 um)	10	27	44	Ohm/sq
N+ Poly sheet resistance (W= 0.06 um)	3	12	23	Ohm/sq
P+ Poly sheet resistance (W= 0.06 um)	3	10	20	Ohm/sq
N+ contact resistance (0.09*0.09 um ²)	11	35	75	Ohm/cont
P+ contact resistance (0.09*0.09 um ²)	11	35	75	Ohm/cont
N+ Poly contact resistance (0.09*0.09 um ²)	7	30	65	Ohm/cont
P+ Poly contact resistance (0.09*0.09 um ²)	7	30	65	Ohm/cont

11.1.1.2 BEOL Layers

11.1.1.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal)

Metal1 sheet resistance (W= 0.09 um)	119	170	221	mOhm/sq
Metal2 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal3 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal4 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal5 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal6 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal7 sheet resistance (W= 0.2 um)	49	70	91	mOhm/sq
Metal8 sheet resistance (W= 0.2 um)	49	70	91	mOhm/sq
Metal9 sheet resistance (W= 0.4 um)	19	27	35	mOhm/sq
Metal10 sheet resistance (W= 0.4 um)	19	27	35	mOhm/sq
Metal10 sheet resistance (32.5KÅ thickness) (W= 2um)	3.6	5.0	6.4	mOhm/sq
AL_RDL(L2) sheet resistance (12KÅ thickness) (W= 2.7 um)	13	22	36	mOhm/sq
AL_RDL(L2) sheet resistance (25KÅ thickness) (W= 2.7 um)	9.2	11.5	13.8	mOhm/sq
AL_RDL(L2) sheet resistance (36KÅ thickness) (W= 2.7 um)	6.24	7.8	9.36	mOhm/sq
Mvia1 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia2 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia3 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia4 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia5 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia6 resistance (0.2*0.2 um ²) Via chain	0.2	0.8	3	Ohm/mvia
Mvia7 resistance (0.2*0.2 um ²) Via chain	0.2	0.8	3	Ohm/mvia
Mvia7 resistance in MIMCAP	0.2	0.8	3	Ohm/mvia
Mvia8 resistance (0.4*0.4 um ²) Via chain	0.1	0.2	3	Ohm/mvia
Mvia9 resistance (0.4*0.4 um ²) Via chain	0.1	0.2	3	Ohm/mvia
Mvia9 (32.5KÅ metal) resistance (0.6*0.6 um ²)	0.03	0.1	1	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (4.0*4.0 um ² , for 12KÅ AL_RDL)	0.005	0.013	0.026	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (4.0*4.0 um ² , for 25KÅ and 36KÅ AL_RDL)	0.004	0.011	0.022	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (3.0*3.0 um ² , for 12KÅ AL_RDL)	0.013	0.033	0.066	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (3.0*3.0 um ² , for 25KÅ and 36KÅ AL_RDL)	0.009	0.022	0.044	Ohm/mvia

11.1.1.2.2 Option: 1P10M (1x,2x,6x Metal)

Metal1 sheet resistance (W= 0.09 um)	119	170	221	mOhm/sq
Metal2 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal3 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal4 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal5 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal6 sheet resistance (W= 0.1 um)	105	150	195	mOhm/sq
Metal7 sheet resistance (W= 0.2 um)	49	70	91	mOhm/sq
Metal8 sheet resistance (W= 0.2 um)	49	70	91	mOhm/sq
Metal9 sheet resistance (W= 0.56 um)	12	17	22	mOhm/sq
Metal10 sheet resistance (W= 0.56 um)	12	17	22	mOhm/sq
AL_RDL(L2) sheet resistance (12KÅ thickness) (W= 2.7 um)	13	22	36	mOhm/sq
AL_RDL(L2) sheet resistance (25KÅ thickness) (W= 2.7 um)	9.2	11.5	13.8	mOhm/sq
AL_RDL(L2) sheet resistance (36KÅ thickness) (W= 2.7 um)	6.24	7.8	9.36	mOhm/sq
Mvia1 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia2 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia3 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia4 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia5 resistance (0.1*0.1 um ²) Via chain	0.6	2	5	Ohm/mvia
Mvia6 resistance (0.2*0.2 um ²) Via chain	0.2	0.8	3	Ohm/mvia
Mvia7 resistance (0.2*0.2 um ²) Via chain	0.2	0.8	3	Ohm/mvia
Mvia8 resistance (0.4*0.4 um ²) Via chain	0.1	0.2	3	Ohm/mvia
Mvia9 resistance (0.4*0.4 um ²) Via chain	0.1	0.2	3	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (4.0*4.0 um ² , for 12KÅ AL_RDL)	0.005	0.013	0.026	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (4.0*4.0 um ² , for 25KÅ and 36KÅ AL_RDL)	0.004	0.011	0.022	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (3.0*3.0 um ² , for 12KÅ AL_RDL)	0.013	0.033	0.066	Ohm/mvia
TMV_RDL(L1) AL-Via resistance (3.0*3.0 um ² , for 25KÅ and 36KÅ AL_RDL)	0.009	0.022	0.044	Ohm/mvia

11.1.2 Temperature Coefficient of Resistors

$$R(T) = R_0 \times [1 + TCR \times (T - 25)]$$

R_0 : room temperature (25°C) resistance; refer to 11.1.1

T : element temperature. (from -55°C to 135°C)

TCR : temperature coefficient, listed as the following :

11.1.2.1 TCR of FEOL Layers

	Min.	Typ.	Max.	Unit
N+ Diffusion sheet resistance	--	1.7E-03	--	1/°C
P+ Diffusion sheet resistance	--	2.0E-03	--	1/°C
N+ Poly sheet resistance	--	1.7E-03	--	1/°C
P+ Poly sheet resistance	--	2.2E-03	--	1/°C

11.1.2.2 TCR of BEOL Layers

11.1.2.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal)

Metal1 sheet resistance	--	2.5E-03	--	1/°C
Metal2 sheet resistance	--	2.6E-03	--	1/°C
Metal3 sheet resistance	--	2.6E-03	--	1/°C
Metal4 sheet resistance	--	2.6E-03	--	1/°C
Metal5 sheet resistance	--	2.6E-03	--	1/°C
Metal6 sheet resistance	--	2.6E-03	--	1/°C
Metal7 sheet resistance	--	3.2E-03	--	1/°C
Metal8 sheet resistance	--	3.2E-03	--	1/°C
Metal9 sheet resistance	--	3.5E-03	--	1/°C
Metal10 sheet resistance	--	3.5E-03	--	1/°C
Metal10 (32.5kÅ thickness)sheet resistance	--	3.5E-03	--	1/°C
AL_RDL(L2) sheet resistance (12KÅ thickness)	--	3.5E-03	--	1/°C
AL_RDL(L2) sheet resistance (25KÅ thickness)	--	3.5E-03	--	1/°C
AL_RDL(L2) sheet resistance (36KÅ thickness)	--	3.5E-03	--	1/°C

11.1.2.2.2 Option: 1P10M (1x,2x,6x Metal)

Metal1 sheet resistance	--	2.5E-03	--	1/°C
Metal2 sheet resistance	--	2.6E-03	--	1/°C
Metal3 sheet resistance	--	2.6E-03	--	1/°C
Metal4 sheet resistance	--	2.6E-03	--	1/°C
Metal5 sheet resistance	--	2.6E-03	--	1/°C
Metal6 sheet resistance	--	2.6E-03	--	1/°C
Metal7 sheet resistance	--	3.2E-03	--	1/°C
Metal8 sheet resistance	--	3.2E-03	--	1/°C
Metal9 sheet resistance	--	3.5E-03	--	1/°C
Metal10 sheet resistance	--	3.5E-03	--	1/°C
AL_RDL(L2) sheet resistance (12KÅ thickness)	--	3.5E-03	--	1/°C
AL_RDL(L2) sheet resistance (25KÅ thickness)	--	3.5E-03	--	1/°C
AL_RDL(L2) sheet resistance (36KÅ thickness)	--	3.5E-03	--	1/°C

11.2 Non-salicide Resistances

	Min.	Typ.	Max.	Unit
N+ Diffusion sheet resistance (L=40um,W=10um)	81	95	109	Ohm/sq
P+ Diffusion sheet resistance (L=40um,W=10um)	97	129	161	Ohm/sq
N+ Poly sheet resistance (L=40um,W=10um)	169	225	281	Ohm/sq
P+ Poly sheet resistance (L=40um,W=10um)	327	385	443	Ohm/sq

Note*8 The values of above sheet resistance were measured by WAT.

11.3 High-Precision Non-Salicide Resistors**11.3.1 Non-salicide N+ Diffusion Resistor**

$$R = R_o * [1 + VCR1 * V + VCR2 * V^2] * [1 + TCR1 * (T - T_o) + TCR2 * (T - T_o)^2]$$

$$R_o = \frac{2 * R_{end} + R_s * L}{W + \Delta W}$$

Where R: total resistance in Ohm

R_o: intrinsic resistance at 25°C in Ohm

R_s: sheet resistance at 25°C in Ohm/sq

R_{end}: end resistance at 25°C in Ohm*um

W: designed non-salicide resistor width in um

L: designed non-salicide resistor SAB length in um

ΔW: deviation of designed resistor width bias at 25°C in um

V: bias voltage across resistor in V

VCR1: linear voltage coefficient of resistor in 1/V

VCR2: quadratic voltage coefficient of resistor in 1/V²

T: device temperature in °C

T_o: nominal device temperature in °C (T_o = 25°C)

TCR1: linear temperature coefficient of resistor in 1/°C

TCR2: quadratic temperature coefficient of resistor in (1/°C)²

	Min.	Typ.	Max.	Unit
N+ Diffusion R _s	81	95	109	Ohm/sq
N+ Diffusion R _{end}	5	6	7	Ohm*um
N+ Diffusion ΔW	-0.0259	-0.0130	-0.0001	um
N+ Diffusion TCR1	--	1.21E-3	--	1/°C
N+ Diffusion TCR2	--	8.01E-7	--	(1/°C) ²
N+ Diffusion VCR1	--	0	--	1/V
N+ Diffusion VCR2	--	1.05E-1	--	1/V ²
Maximum Current Density	--	--	1.0	mA/um

11.3.2 Non-salicide P+ Poly Resistor

$$R = R_o * [1 + VCR1 * (V/L) + VCR2 * (V/L)^2] * [1 + TCR1 * (T - T_o) + TCR2 * (T - T_o)^2]$$

$$R_o = \frac{2 * R_{end} + R_s * L}{W + \Delta W}$$

Where R: total resistance in Ohm

R_o: intrinsic resistance at 25°C in Ohm

R_s: sheet resistance at 25°C in Ohm/sq

R_{end}: end resistance at 25°C in Ohm*um

W: designed non-salicide resistor width in um

L: designed non-salicide resistor SAB length in um

ΔW: deviation of designed resistor width bias at 25°C in um

V: bias voltage across resistor in V

VCR1: linear voltage coefficient of resistor in m/V

VCR2: quadratic voltage coefficient of resistor in m²/V²

T: device temperature in °C

T_o: nominal device temperature in °C (T_o = 25 °C)

TCR1: linear temperature coefficient of resistor in 1/°C

TCR2: quadratic temperature coefficient of resistor in (1/°C)²

	Min.	Typ.	Max.	Unit
P+ Poly R _s	327	385	443	Ohm/sq
P+ Poly R _{end}	8	15	22	Ohm*um
P+ Poly ΔW	-0.0267	-0.0180	-0.0093	um
P+ Poly TCR1	--	8.99E-5	--	1/°C
P+ Poly TCR2	--	4.94E-7	--	(1/°C) ²
P+ Poly VCR1	--	0	--	m/V
P+ Poly VCR2	--	3.23E-14	--	m ² /V ²
Maximum Current Density	--	--	0.5	mA/um

11.3.3 Non Salicide HR POLY Resistor

$$R(\Omega) = R_0 * (1 + VCR1 * (\frac{V}{L}) + VCR2 * (\frac{V}{L})^2) * (1 + TCR1 * (T - T_0) + TCR2 * (T - T_0)^2)$$

$$R_0 = \frac{2 * R_{end} + R_s * (L - \Delta L)}{W + \Delta W}$$

Where:

R: total resistance in ohm

Ro: intrinsic resistance at 25°C in ohm

Rs: sheet resistance at 25°C in ohm/sq

Rend: end resistance at 25°C in ohm*um

W: designed non-salicide resistor width in um

L: designed non-salicide resistor SAB length in um

 ΔW : deviation of designed resistor width bias at 25°C in um ΔL : deviation of designed resistor length bias at 25°C in um

V: bias voltage across resistor

VCR1: linear voltage coefficient of resistor in m/V for HR POLY resistor

VCR2: quadratic voltage coefficient of resistor in m^2/V^2 for HR POLY resistor

T: device temperature in °C

To: nominal device temperature in °C (To = 25 °C)

TCR1: linear temperature coefficient of resistor in 1/°C

TCR2: quadratic temperature coefficient of resistor in 1/°C²

	Min.	Typ.	Max.	Unit
HR POLY Rs	894	1052	1210	Ohm/sq
HR POLY Rend	204	229	254	Ohm*um
HR POLY ΔW	-0.0257	-0.019	-0.0123	um
HR POLY ΔL	--	0.76	--	um
HR POLY VCR1	--	0	--	m/V
HR POLY VCR2	--	-7.29E-14	--	m^2/V^2
HR POLY TCR1	--	-3.97E-4	--	1/°C
HR POLY TCR2	--	8.88E-7	--	1/°C ²

11.4 N-well Resistor

	Min.	Typ.	Max.	Unit
11.4.1 Sheet resistance of N-well				
RSNWELL (L=40um,W=10um)	476	595	714	Ohm/sq

The N-well Resistance is given by :

$$R = R_s (NW) \times \left(\frac{L}{W + \Delta W} \right) \times [1 + TCR1(T-25) + TCR2(T-25)^2]$$

Where:

R	: N-well Resistance in Ohm
Rs(NW)	: Sheet Resistance of the N-well under STI (=577Ohm/sq)
L	: Design Length in um
W	: Design Width in um (W larger than 2um is recommended to decrease resistance variation of width dependence)
ΔW	: Width Bias, -0.31 um
T	: Temperature in °C
TCR1	: Linear temperature coefficient of resistor , 1.58E-3 /°C
TCR2	: Quadratic temperature coefficient of resistor, 8.62E-6 /°C ²

12. MIMCAP (Metal Insulator Metal Capacitor)

12.1 MIMCAP Electrical Parameters	Min.	Typ.	Max.	Unit
Ca (Area Component of Capacitance)	1.70	2.00	2.30	fF/um ²
Cp (Perimeter Component of Capacitance)	--	0.058	--	fF/um
Rs_bot (Sheet resistance of bottom plate) (W=2.8um)	2.0	4.5	7.0	Ohm/sq
Rs_top (Sheet resistance of top metal plate) (W=2.0um)	17	26	35	Ohm/sq
Rc_Via_bot (bottom plate Via Resistance, 0.2*0.2 um ²)	3	5.2	7.4	Ohm/Via
Rc_Via_top (top plate Via Resistance, 0.2*0.2 um ²)	9	12	15	Ohm/Via
TCR1 (Temperature Coefficient)	--	16.7	--	ppm/°C
TCR2 (Temperature Coefficient)	--	-0.0051	--	ppm/°C ²
VC1 (Voltage Coefficient)	--	46.5	--	ppm/V
VC2 (Voltage Coefficient)	--	20.4	--	ppm/V ²
BV (10mA/cm ²)	15	--	--	V

13. Appendix Revision History

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
T.0	1	12/23/2005	-	-	Original
0.1	1	01/10/2007	G-02-LOGIC/MIXED_MODE65N-1P10M-LL/LOW_K-EDR	G-02-LOGIC/MIXED_MODE65N-LL/LOW_K-EDR	(1) Si data update, range +/- 10% (2) Add Cu-pad option
			3.2 Inter-layer Dielectric Thickness Poly1 Diffusion (Dual Gate Oxide) @Thin Oxide TBD 19.5 TBD A @Thick Oxide TBD 52 TBD A Substrate (Field Oxide) TBD 3.5 TBD kA Metal1 Diffusion 4.2 4.7 5.2 kA Substrate 7.4 8.2 9.0 kA Poly1 3.3 3.7 4.1 kA Metal2 Diffusion 7.3 8.1 8.9 kA Substrate 10.4 11.6 12.8 kA Poly1 6.4 7.1 7.8 kA Metal1 1.4 1.6 1.8 kA Metal3 Diffusion 10.7 11.9 13.1kA Substrate 13.9 15.4 16.9 kA Poly1 9.8 10.9 12.0 kA Metal1 4.9 5.4 5.9 kA Metal2 1.4 1.6 1.8 kA Metal4 Diffusion 14.1 15.7 17.3 kA Substrate 17.3 19.2 21.1 kA Poly1 13.2 14.7 16.2 kA Metal1 8.3 9.2 10.1 kA Metal2 4.9 5.4 5.9 kA Metal3 1.4 1.6 1.8 kA Metal5 Diffusion 17.6 19.5 21.5 kA Substrate 20.7 23.0 25.3 kA Poly1 16.7 18.5 20.4 kA Metal1 11.7 13.0 14.3 kA Metal2 8.3 9.2 10.1 kA Metal3 4.9 5.4 5.9 kA Metal4 1.4 1.6 1.8 kA Metal6 Diffusion 21.0 23.3 25.6 kA Substrate 24.1 26.8 29.5 kA Poly1 20.1 22.3 24.5 kA Metal1 15.1 16.8 18.5 kA Metal2 11.7 13.0 14.3 kA Metal3 8.3 9.2 10.1 kA Metal4 4.9 5.4 5.9 kA Metal5 1.4 1.6 1.8 kA Metal7 Diffusion 25.8 28.7 31.6 kA Substrate 29.0 32.2 35.4 kA Poly1 24.9 27.7 30.5 kA Metal1 20.0 22.2 24.4 kA Metal2 16.6 18.4 20.2 kA Metal3 13.1 14.6 16.1 kA Metal4 9.7 10.8 11.9 kA Metal5 6.3 7.0 7.7 kA Metal6 2.9 3.2 3.5 kA	3.2 Inter-layer Dielectric Thickness Poly1 Diffusion (Gate Oxide) @1.2V Electrical 25 26 27 A @2.5V Electrical 59 62 65 A @3.3V Electrical 69 72 75 A Substrate (Field Oxide) 3.2 3.5 3.8 kA Metal1 Diffusion 3.81 4.23 4.65 kA Substrate 6.96 7.73 8.50 kA Poly1 2.91 3.23 3.55 kA Metal2 Diffusion 6.87 7.63 8.39 kA Substrate 10.02 11.13 12.24 kA Poly1 5.97 6.63 7.29 kA Metal1 1.44 1.60 1.76 kA Metal3 Diffusion 10.29 11.43 12.57 kA Substrate 13.44 14.93 16.42 kA Poly1 9.39 10.43 11.47 kA Metal1 4.86 5.40 5.94 kA Metal2 1.44 1.60 1.76 kA Metal4 Diffusion 13.71 15.23 16.75 kA Substrate 16.86 18.73 20.60 kA Poly1 12.81 14.23 15.65 kA Metal1 8.28 9.20 10.12 kA Metal2 4.86 5.40 5.94 kA Metal3 1.44 1.60 1.76 kA Metal5 Diffusion 17.13 19.03 20.93 kA Substrate 20.28 22.53 24.78 kA Poly1 16.23 18.03 19.83 kA Metal1 11.70 13.00 14.30 kA Metal2 8.28 9.20 10.12 kA Metal3 4.86 5.40 5.94 kA Metal4 1.44 1.60 1.76 kA Metal6 Diffusion 20.55 22.83 25.11 kA Substrate 23.70 26.33 28.96 kA Poly1 19.65 21.83 24.01 kA Metal1 15.12 16.80 18.48 kA Metal2 11.70 13.00 14.30 kA Metal3 8.28 9.20 10.12 kA Metal4 4.86 5.40 5.94 kA Metal5 1.44 1.60 1.76 kA Metal7 Diffusion 25.41 28.23 31.05 kA Substrate 28.56 31.73 34.90 kA Poly1 24.51 27.23 29.95 kA Metal1 19.98 22.20 24.42 kA Metal2 16.56 18.40 20.24 kA Metal3 13.14 14.60 16.06 kA Metal4 9.72 10.80 11.88 kA Metal5 6.30 7.00 7.70 kA Metal6 2.88 3.20 3.52 kA	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
0.1	1	01/10/2007	Metal8 Diffusion 32.0 35.5 39.1 kA Substrate 35.1 39.0 42.9 kA Poly1 31.1 34.5 38.0 kA Metal1 26.1 29.0 31.9 kA Metal2 22.7 25.2 27.7 kA Metal3 19.3 21.4 23.5 kA Metal4 15.8 17.6 19.4 kA Metal5 12.4 13.8 15.2 kA Metal6 9.0 10.0 11.0 kA Metal7 2.9 3.2 3.5 kA Metal9 Diffusion 40.7 45.25 49.8 kA Substrate 43.9 48.75 53.6 kA Poly1 39.8 44.25 48.7 kA Metal1 34.9 38.75 42.6 kA Metal2 31.5 34.95 38.4 kA Metal3 28.0 31.15 34.3 kA Metal4 24.6 27.35 30.1 kA Metal5 21.2 23.55 25.9 kA Metal6 17.8 19.75 21.7 kA Metal7 11.7 12.95 14.2 kA Metal8 5.5 6.15 6.8 kA Metal10 Diffusion 53.5 59.4 65.3 kA Substrate 56.6 62.9 69.2 kA Poly1 52.6 58.4 64.2 kA Metal1 47.6 52.9 58.2 kA Metal2 44.2 49.1 54.0 kA Metal3 40.8 45.3 49.8 kA Metal4 37.4 41.5 45.7 kA Metal5 33.9 37.7 41.5 kA Metal6 30.5 33.9 37.3 kA Metal7 24.4 27.1 29.8 kA Metal8 18.3 20.3 22.3 kA Metal9 5.5 6.15 6.8 kA AL-RDL(L2) Diffusion 70.3 78.1 85.9 kA Substrate 73.4 81.6 89.8 kA Poly1 69.4 77.1 84.8 kA Metal1 64.4 71.6 78.8 kA Metal2 61.0 67.8 74.6 kA Metal3 57.6 64.0 70.4 kA Metal4 54.2 60.2 66.2 kA Metal5 50.8 56.4 62.0 kA Metal6 47.3 52.6 57.9 kA Metal7 41.2 45.8 50.4 kA Metal8 35.1 39.0 42.9 kA Metal9 22.4 24.85 27.3 kA Metal10 9.6 10.7 11.8 kA	Metal8 Diffusion 31.53 35.03 38.53 kA Substrate 34.68 38.53 42.38 kA Poly1 30.63 34.03 37.43 kA Metal1 26.10 29.00 31.90 kA Metal2 22.68 25.20 27.72 kA Metal3 19.26 21.40 23.54 kA Metal4 15.84 17.60 19.36 kA Metal5 12.42 13.80 15.18 kA Metal6 9.00 10.00 11.00 kA Metal7 2.88 3.20 3.52 kA Metal9 Diffusion 40.30 44.78 49.26 kA Substrate 43.45 48.28 53.11 kA Poly1 39.40 43.78 48.16 kA Metal1 34.88 38.75 42.63 kA Metal2 31.46 34.95 38.45 kA Metal3 28.04 31.15 34.27 kA Metal4 24.62 27.35 30.09 kA Metal5 21.20 23.55 25.91 kA Metal6 17.78 19.75 21.73 kA Metal7 11.66 12.95 14.25 kA Metal8 5.54 6.15 6.77 kA Metal10 Diffusion 53.31 59.23 65.15 kA Substrate 56.19 62.43 68.67 kA Poly1 52.14 57.93 63.72 kA Metal1 47.61 52.90 58.19 kA Metal2 44.19 49.10 54.01 kA Metal3 40.77 45.30 49.83 kA Metal4 37.35 41.50 45.65 kA Metal5 33.93 37.70 41.47 kA Metal6 30.51 33.90 37.29 kA Metal7 24.39 27.10 29.81 kA Metal8 18.27 20.30 22.33 kA Metal9 5.54 6.15 6.77 kA AL-RDL(L2) Diffusion 71.67 79.63 87.59 kA Substrate 74.82 83.13 91.44 kA Poly1 70.77 78.63 86.49 kA Metal1 66.24 73.60 80.96 kA Metal2 62.82 69.80 76.78 kA Metal3 59.40 66.00 72.60 kA Metal4 55.98 62.20 68.42 kA Metal5 52.56 58.40 64.24 kA Metal6 49.14 54.40 60.06 kA Metal7 43.02 47.80 52.58 kA Metal8 36.90 41.00 45.10 kA Metal9 24.17 26.85 29.54 kA Metal10 11.43 12.70 13.97 kA Cu-Pad Passivation Thickness 8.7 9.7 10.7 kA	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
0.1	1	01/10/2007	3.3 Junction Depth N-Well TBD um N+ Diffusion for 1.2V device TBD um P+ Diffusion for 1.2V device TBD um N+ Diffusion for 2.5V device TBD um P+ Diffusion for 2.5V device TBD um	3.3 Junction Depth N-Well 1.5 um N+ Diffusion for 1.2V device 0.1 um P+ Diffusion for 1.2V device 0.1 um N+ Diffusion for 2.5V device 0.1 um P+ Diffusion for 2.5V device 0.1 um N+ Diffusion for 3.3V device 0.1 um P+ Diffusion for 3.3V device 0.1 um	(1) Si data update (2) Add 3.3V option
			3.4 Interconnect Thickness Metal1 1.62 1.80 1.98 kA Metal2 1.98 2.20 2.42 kA Metal3 1.98 2.20 2.42 kA Metal4 1.98 2.20 2.42 kA Metal5 1.98 2.20 2.42 kA Metal6 1.98 2.20 2.42 kA Metal7 3.24 3.60 3.96 kA Metal8 3.24 3.60 3.96 kA Metal9 3.24 3.60 3.96 kA Metal10 7.20 8.00 8.80 kA AL-RDL(L2) 10.8 12.0 13.2 kA	3.4 Interconnect Thickness Metal1 1.53 1.80 2.07 kA Metal2 1.87 2.20 2.53 kA Metal3 1.87 2.20 2.53 kA Metal4 1.87 2.20 2.53 kA Metal5 1.87 2.20 2.53 kA Metal6 1.87 2.20 2.53 kA Metal7 3.06 3.60 4.14 kA Metal7 3.06 3.60 4.14 kA Metal9 6.80 8.00 9.20 kA Metal10 6.80 8.00 9.20 kA AL-RDL(L2) 10.2 12.0 13.8 kA	(1) Modify M9 (2) Modify range to +/- 15%
			4. Low Leakage Device with High Threshold Voltage Option (LL_HVT) Electrical Parameters 4.1 1.2V NFET Electrical Parameters Tox_inv ^a (@100kHz, VG=1.2V, VB=0V) TBD TBD TBD A Tox_gf ^a (@VG=-2V, VB=0V) TBD 19.5 TBD A Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) TBD 0.7 TBD V Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD= 1.2V) TBD 0.54 TBD V Ion (W/L=1/0.06, @VD=VG= 1.2V) TBD 470 TBD uA/um Ioff (W/L=1/0.06, @VD= 1.2 V, VG= 0 V) -- 15 TBD pA/um Ioff (W/L=1/0.06, @VD= 1.2 V, VG= 0V, T=85°C) -- 0.145 TBD nA/um Cj_area (Vj=0V) TBD 1.3 TBD fF/um2 Coverl (VG=0V)-- 0.31--fF/um	4. Low Leakage Device with High Threshold Voltage Option (LL_HVT) Electrical Parameters 4.1 1.2V NFET Electrical Parameters Tox_inv ^a (@100kHz, VG=1.2V, VB=0V) 25 ^d 26 27 A Tox_gf ^a (@VG=-2V, VB=0V) 18.5 19.5 20.5 A Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) 0.594 0.67 0.735 V Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD= 1.2V) 0.444 0.52 0.585 V Ion (W/L=1/0.06, @VD=VG= 1.2V) 364 445 535 uA/um Ioff (W/L=1/0.06, @VD= 1.2 V, VG= 0 V) -- 16 125 pA/um Ioff (W/L=1/0.06, @VD= 1.2 V, VG= 0V, T=85°C) -- 252 1446 pA/um Cj_area (Vj=0V) 1.4 1.6 1.8 fF/um ² Coverl (VG=-0.5V) -- 0.22 --fF/um	(1) Data update (2) Remove Vbd_ox, Vbd and replace w/ Jg_inv (3) Replace um2 with um ²
			4.2 1.2V PFET Electrical Parameters, in N-Well Tox_inv (@100kHz, VG=-1.2V, VB=0V) TBD TBD TBD A Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V) TBD -0.6 TBD V Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V) TBD -0.5 TBD V Ion (W/L=1/0.06, @VD=VG=-1.2V) TBD -210 TBD uA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V) -- -10 TBD pA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C) -- -0.135 TBD nA/um Cj_area (Vj=0V) TBD 1.3 TBD fF/um2 Coverl (VG=0V)-- 0.28--fF/um	4.2 1.2V PFET Electrical Parameters, in N-Well Tox_inv (@100kHz, VG=-1.2V, VB=0V) 27 28 29 A Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V) -0.538 -0.61 -0.67 V Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V) -0.428 -0.5 -0.56 V Ion (W/L=1/0.06, @VD=VG=-1.2V) -171 -210 -253 uA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V) -- -10 -40 pA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C) -- -149 -942 pA/um Cj_area (Vj=0V) 11 1.3 1.4 fF/um ² Coverl (VG=0.5V) -- 0.2 --fF/um	(1) Data update (2) Remove Vbd_ox, Vbd and replace w/ Jg_inv (3) Replace um2 with um ²
			4.3 Gate Delay Delay Time TBD 15.6 TBD psec/stage	4.3 Gate Delay Delay Time 12.7 15.8 19.8 psec/stage	Data update

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0.1	1	01/10/2007	5.Low Leakage Device with Regular Threshold Voltage Option (LL_RVT) Electrical Parameters 5.1 1.2V NFET Electrical Parameters Tox_inv (@100kHz, VG=1.2V, VB=0V) TBD TBD TBD A Tox_gl (@VG=-2V, VB=0V) TBD 19.5 TBD A Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) TBD 0.59 TBD V Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD=1.2V) TBD 0.42 TBD V Ion (W/L=1/0.06, @VD=VG=1.2V) TBD 640 TBD uA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V) -- 200 TBD pA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V, T=85°C) --TBD 2 TBD nA/um Cj_area (Vj=0V) TBD 1.3 TBD fF/um ² Coverl (VG=0V) -- 0.31 -- fF/um	5.Low Leakage Device with Regular Threshold Voltage Option (LL_RVT) Electrical Parameters 5.1 1.2V NFET Electrical Parameters Tox_inv (@100kHz, VG=1.2V, VB=0V) 2526 27 A Tox_gl (@VG=-2V, VB=0V) 18.5 19.5 20.5 A Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) 0.47 0.54 0.61 V Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD=1.2V) 0.31 0.38 0.45 V Ion (W/L=1/0.06, @VD=VG=1.2V) 517 630 755 uA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V) -- 500 6984 pA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V, T=85°C) -- 8.6 48.2 nA/um Cj_area (Vj=0V) 1.2 1.3 1.4 fF/um ² Coverl (VG=-0.5V) --0.24 -- fF/um	(1) Data update (2) Remove Vbd_ox, Vbd and replace w/ Jg_inv (3) Replace um2 with um ²
			5.2 1.2V PFET Electrical Parameters Tox_inv (@100kHz, VG=-1.2V, VB=0V) TBD TBD TBD A Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V) TBD -0.52 TBD V Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V) TBD -0.39 TBD V Ion (W/L=1/0.06, @VD=VG=-1.2V) TBD -305 TBD uA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V) -- -200 TBD pA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C) -- -3 TBD nA/um Cj_area (Vj=0V) TBD 1.3 TBD fF/um ² Coverl (VG=0V) -- 0.28 -- fF/um	5.2 1.2V PFET Electrical Parameters Tox_inv (@100kHz, VG=-1.2V, VB=0V) 27 28 29 A Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V) -0.57 -0.5 -0.44 V Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V) -0.44 -0.37 -0.31 V Ion (W/L=1/0.06, @VD=VG=-1.2V) -252 -310 -373 uA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V) -- -200 -2010 pA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C) -- -4.2 -18.9 nA/um Cj_area (Vj=0V) 1.1 1.2 1.3 fF/um ² Coverl (VG=0.5V) -- 0.24 -- fF/um	(1) Data update (2) Remove Vbd_ox, Vbd and replace w/ Jg_inv
			5.3 Gate Delay Delay Time TBD 10.3 TBD psec/stage	5.3 Gate Delay Delay Time 8.0 9.8 12.1 psec/stage	Data update
			6.1 2.5V NFET Electrical Parameters Tox_inv (@100kHz, VG=2.5V, VB=0V) TBD 62 TBD A Vtlin (W/L=10/0.24, @ID=300nA*W/L, VD=0.05V) TBD 0.52 TBD V Vtsat (W/L=10/0.24, @ID=300nA*W/L, VD=2.5V) TBD 0.44 TBD V Ion (W/L=10/0.24, @VD=VG=2.5V) TBD 600 TBD uA/um Ioff (W/L=10/0.24, @VD=2.5V, VG=0V) --15 TBD pA/um Ioff (W/L=10/0.24, @VD=2.5V, VG=0V, T=85°C) --TBD TBD nA/um Isub (W/L=10/0.24; Maximum) --TBD -- uA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, 1V, VD=0.05V) TBDTBDTBD V Cj_area (Vj=0V) TBD 1.4 TBD fF/um ² Coverl (VG=0V) --0.3 -- fF/um	6.1 2.5V NFET Electrical Parameters Tox_inv (@100kHz, VG=2.5V, VB=0V) 59 62 65 A Vtlin (W/L=10/0.24, @ID=300nA*W/L, VD=0.05V) 0.49 0.585 0.67 V Vtsat (W/L=10/0.24, @ID=300nA*W/L, VD=2.5V) 0.35 0.44 0.52 V Ion (W/L=10/0.24, @VD=VG=2.5V) 522 600 687 uA/um Ioff (W/L=10/0.24, @VD=2.5V, VG=0V) -- 10 13 pA/um Ioff (W/L=10/0.24, @VD=2.5V, VG=0V, T=85°C) -- 479 3168 pA/um Isub (W/L=10/0.24; Maximum) -- 0.78 -- uA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, -2.5V, VD=0.05V) TBDTBDTBD V Cj_area (Vj=0V) 1.1 1.2 1.3 fF/um ² Coverl (VG=-0.5V) -- 0.26 -- fF/um	(1) Data update (2) Remove Vbd_ox, Vbd and replace w/ Jg_inv

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0.1	1	01/10/2007	6.2 2.5V PFET Electrical Parameters Tox_inv (@100kHz, VG=-2.5V, VB=0V) TBD 64 TBD A Vtlin (W/L=10/0.24, @ID=-70nA*W/L, VD=-0.05V) TBD -0.48 TBD V Vtsat (W/L=10/0.24, @ID=-70nA*W/L, VD=-2.5V) TBD -0.42 TBD V Ion (W/L=10/0.24, @VD=VG=-2.5V) TBD -300 TBD uA/um Ioff (W/L=10/0.24, @VD=-2.5V, VG=0V) -- -15 TBD pA/um Ioff (W/L=10/0.24, @VD=-2.5V, VG=0V, T=85°C) -- TBD TBD nA/um Isub (W/L=10/0.24; Maximum) -- TBD -- uA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, 1V, VD=-0.05V) TBD TBD TBD V Cj_area (Vj=0V) TBD TBD fF/um2 Coverl (VG=0V) -- 0.25 -- fF/um	6.2 2.5V PFET Electrical Parameters Tox_inv (@100kHz, VG=-2.5V, VB=0V) 61.2 64.2 67.2 A Vtlin (W/L=10/0.24, @ID=-70nA*W/L, VD=-0.05V) -0.45 -0.535 -0.62 V Vtsat (W/L=10/0.24, @ID=-70nA*W/L, VD=-2.5V) -0.39 -0.48 -0.56 V Ion (W/L=10/0.24, @VD=VG=-2.5V) -240 -275 -317 uA/um Ioff (W/L=10/0.24, @VD=-2.5V, VG=0V) -- -3 -127 pA/um Ioff (W/L=10/0.24, @VD=-2.5V, VG=0V, T=85°C) -- -143 -996 pA/um Isub (W/L=10/0.24; Maximum) -- TBD -- uA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, 2.5V, VD=-0.05V) TBD TBD TBD V Cj_area (Vj=0V) 1.1 1.2 1.3fF/um2 Coverl (VG=0.5V) -0.24 -- fF/um	(1) Data update (2) Remove Vbd_ox, Vbd and replace w/ Jg_inv
			6.3 Gate Delay Delay Time TBD 21.5 TBD psec/stage	6.3 Gate Delay Delay Time 20.4 22.6 25.1 psec/stage	Data update
				7. 3.3V MOSFET Electrical Parameters 7.1 3.3V NFET Electrical Parameters, in P-Sub 7.2 3.3V PFET Electrical Parameters, in N-Well 7.3 Gate Delay	New section
			7. Native NFET Electrical parameters 7.1 Thin Oxide Native NFET in P-Sub @1.2V 7.2 Thick Oxide Native NFET in P-Sub @2.5V	8. Native NFET Electrical parameters 8.1 Thin Oxide Native NFET in P-Sub @1.2V 8.2 Thick Oxide Native NFET in P-Sub @2.5V	New section
			8.1.1 Sheet resistance of Salicide and Metal P+ sheet resistance 4 11 20 Ohm/sq N+ Poly sheet resistance 5 14 26 Ohm/sq P+ Poly sheet resistance 5 14 26 Ohm/sq N+ contact resistance 20 45 90 Ohm/cont P+ contact resistance 20 45 90 Ohm/cont N+ Poly contact resistance 20 45 90 Ohm/cont P+ Poly contact resistance 20 45 90 Ohm/cont AL_RDL(L2) sheet resistance 18 27 50 mOhm/sq Mvia1 resistance 0.6 1.5 6 Ohm/mvia Mvia2 resistance 0.6 1.5 6 Ohm/mvia Mvia3 resistance 0.6 1.5 6 Ohm/mvia Mvia4 resistance 0.6 1.5 6 Ohm/mvia Mvia5 resistance 0.6 1.5 6 Ohm/mvia Mvia6 resistance 0.2 0.8 6 Ohm/mvia Mvia7 resistance 0.2 0.8 6 Ohm/mvia Mvia8 resistance 0.1 0.4 3 Ohm/mvia Mvia9 resistance 0.1 0.4 3 Ohm/mvia TMV_RDL(L1) AL-Via resistance 0.02 0.04 0.1 Ohm/mvia	9.1.1 Sheet resistance of Salicide and Metal P+ sheet resistance 3 9 20 Ohm/sq N+ Poly sheet resistance 3 12 23 Ohm/sq P+ Poly sheet resistance 3 10 20 Ohm/sq N+ contact resistance 10 25 50 Ohm/cont P+ contact resistance 9 23 46 Ohm/cont N+ Poly contact resistance 9 26 52 Ohm/cont P+ Poly contact resistance 9 26 52 Ohm/cont AL_RDL(L2) sheet resistance 18 30 50 mOhm/sq Mvia1 resistance 0.6 2 5 Ohm/mvia Mvia2 resistance 0.6 2 5 Ohm/mvia Mvia3 resistance 0.6 2 5 Ohm/mvia Mvia4 resistance 0.6 2 5 Ohm/mvia Mvia5 resistance 0.6 2 5 Ohm/mvia Mvia6 resistance 0.2 0.8 3 Ohm/mvia Mvia7 resistance 0.2 0.8 3 Ohm/mvia Mvia8 resistance Via chain 0.1 0.2 3 Ohm/mvia Mvia9 resistance Via chain 0.1 0.2 3 Ohm/mvia TMV_RDL(L1) AL-Via resistance 0.02 0.05 0.1 Ohm/mvia	Data update

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0.1	1	01/10/2007	8.1.2 Temperature Coefficient of Resistors N+ sheet resistance 3.0E-03 1/°C P+ sheet resistance 3.0E-03 1/°C N+Poly sheet resistance 3.0E-03 1/°C Metal2 sheet resistance 2.5E-03 1/°C Metal6 sheet resistance 2.5E-03 1/°C AL_RDL(L2) sheet resistance TBD 1/°C	9.1.2 Temperature Coefficient of Resistors N+ Diffusion sheet resistance 2.5E-03 1/°C P+ Diffusion sheet resistance 2.8E-03 1/°C N+Poly sheet resistance 2.8E-03 1/°C Metal2 sheet resistance 2.6E-03 1/°C Metal6 sheet resistance 2.6E-03 1/°C AL_RDL(L2) sheet resistance 3.5E-03 1/°C	Data update
			8.2 Non-salicide Resistances N+ sheet resistance (L=100um,W=20um) TBD 102 TBD Ohm/sq P+ sheet resistance (L=100um,W=20um) TBD 119 TBD Ohm/sq N+ Poly sheet resistance (L=100um,W=20um) TBD 173 TBD Ohm/sq P+ Poly sheet resistance (L=100um,W=20um) TBD 336 TBD Ohm/sq	9.2 Non-salicide Resistances N+ Diffusion sheet resistance (L=40um,W=10um) 88 103 118 Ohm/sq P+ Diffusion sheet resistance (L=40um,W=10um) 103 137 171 Ohm/sq N+ Poly sheet resistance (L=40um,W=10um) 161 214 268 Ohm/sq P+ Poly sheet resistance (L=40um,W=10um) 342 402 462 Ohm/sq	Data update
			10.3.1 Non-salicide N+ Diffusion Resistor N+ Diffusion Rs TBD TBD TBD Ohm/sq N+ Diffusion Rend TBD TBD TBD Ohm*um N+ Diffusion ΔW TBD TBD TBD um N+ Diffusion TCR1 -- TBD -- 1/°C N+ Diffusion TCR2 -- TBD -- (1/°C) ² N+ Diffusion VCR1 -- TBD -- 1/V N+ Diffusion VCR2 -- TBD -- 1/V ² Maximum Current Density -- -- TBD mA/um	9.3.1 Non-salicide N+ Diffusion Resistor N+ Diffusion Rs 87 102 117 Ohm/sq N+ Diffusion Rend 5 6 7 Ohm*um N+ Diffusion ΔW -0.0259 -0.0130 -0.0001 um N+ Diffusion TCR1 -- 1.21E-3 TBD -- 1/°C N+ Diffusion TCR2 -- 8.01E-7 TBD -- (1/°C) ² N+ Diffusion VCR1 -- 0 -- 1/V N+ Diffusion VCR2 -- 1.05E-1 TBD -- 1/V ² Maximum Current Density -- -- 1.0 mA/um	Data update

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0.1	1	01/10/2007	8.3.2 Non-salicide P+ Poly Resistor P+ Poly Rs TBD TBD TBD Ohm/sq P+ Poly Rend TBD TBD TBD Ohm*um P+ Poly ΔW TBD TBD TBD um P+ Poly TCR1 -- TBD -- 1/°C P+ Poly TCR2 -- TBD -- (1/°C) ² P+ Poly VCR1 -- TBD -- m/V P+ Poly VCR2 -- TBD -- m ² /V ² Maximum Current Density -- -- TBD mA/um	9.3.2 Non-salicide P+ Poly Resistor P+ Poly Rs 337 396 455 Ohm/sq P+ Poly Rend 8 15 22 Ohm*um P+ Poly ΔW -0.0267 -0.0180 0.0093 um P+ Poly TCR1 -- 8.99E-5 -- 1/°C P+ Poly TCR2 -- 4.94E-7 -- (1/°C) ² P+ Poly VCR1 -- 0 -- m/V P+ Poly VCR2 -- 3.23E-14 -- m ² /V ² Maximum Current Density -- -- 0.5 mA/um	Data update
			8.4.1 Sheet resistance of N-well RSNWELL (L= 100um,W= 20um) TBD 605 TBD Ohm/sq Maximum copper wire(Metal X , X= 1~10) width = 12um	9.4.1 Sheet resistance of N-well RSNWELL (L=40 um,W=10um) 476 595 714 Ohm/sq Non.	(1) Data update (2) Remove Max. wire description

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0.2	1	05/10/2007	Non Metal1 Diffusion 3.81 4.23 4.65 kA Substrate 6.96 7.73 8.50 kA Poly1 2.91 3.23 3.55 kA Metal2 Diffusion 6.87 7.63 8.39 kA Substrate 10.02 11.13 12.24 kA Poly1 5.97 6.63 7.29 kA Metal3 Diffusion 10.29 11.43 12.57 kA Substrate 13.44 14.93 16.42 kA Poly1 9.39 10.43 11.47 kA Metal4 Diffusion 13.71 15.23 16.75 kA Substrate 16.86 18.73 20.60 kA Poly1 12.81 14.23 15.65 kA Metal5 Diffusion 17.13 19.03 20.93 kA Substrate 20.28 22.53 24.78 kA Poly1 16.23 18.03 19.83 kA Metal6 Diffusion 20.55 22.83 25.11 kA Substrate 23.70 26.33 28.96 kA Poly1 19.65 21.83 24.01 kA Metal7 Diffusion 25.41 28.23 31.05 kA Substrate 28.56 31.73 34.90 kA Poly1 24.51 27.23 29.95 kA Metal8 Diffusion 31.53 35.03 38.53 kA Substrate 34.68 38.53 42.38 kA Poly1 30.63 34.03 37.43 kA Metal9 Diffusion 40.30 44.78 49.26 kA Substrate 43.45 48.28 53.11 kA Poly1 39.40 43.78 48.16 kA Metal10 Diffusion 53.31 59.23 65.15 kA Substrate 56.19 62.43 68.67 kA Poly1 52.14 57.93 63.72 kA AL-RDL(L2) Diffusion 71.67 79.63 87.59 kA Substrate 74.82 83.13 91.44 kA Poly1 70.77 78.63 86.49 kA	3.2 Inter-layer Dielectric Thickness 3.2.1 FEOL Layers @1.8V Electrical 36 39 42 A 3.2.2.1 UMC platform offering: 1P10M2T2F Metal1 Diffusion 4.23 4.70 5.17 kA Substrate 7.38 8.20 9.02 kA Poly1 3.33 3.70 4.07 kA Metal2 Diffusion 7.29 8.10 8.91 kA Substrate 10.44 11.60 12.76 kA Poly1 6.39 7.10 7.81 kA Metal3 Diffusion 10.71 11.90 13.09 kA Substrate 13.86 15.40 16.94 kA Poly1 9.81 10.90 11.99 kA Metal4 Diffusion 14.13 15.70 17.27 kA Substrate 17.28 19.20 21.12 kA Poly1 13.23 14.70 16.17 kA Metal5 Diffusion 17.55 19.50 21.45 kA Substrate 20.70 23.00 25.30 kA Poly1 16.65 18.50 20.35 kA Metal6 Diffusion 20.97 23.30 25.63 kA Substrate 24.12 26.80 29.48 kA Poly1 20.07 22.30 24.53 kA Metal7 Diffusion 25.83 28.70 31.57 kA Substrate 28.98 32.20 35.42 kA Poly1 24.94 27.70 30.47 kA Metal8 Diffusion 31.95 35.50 39.05 kA Substrate 35.10 39.00 42.90 kA Poly1 31.05 34.50 37.95 kA Metal9 Diffusion 40.73 45.25 49.78 kA Substrate 43.88 48.75 53.63 kA Poly1 39.83 44.25 48.68 kA Metal10 Diffusion 53.46 59.40 65.34 kA Substrate 56.61 62.90 69.19 kA Poly1 52.56 58.40 64.24 kA AL-RDL(L2) Diffusion 72.09 80.10 88.11 kA Substrate 75.24 83.60 91.96 kA Poly1 71.19 79.10 87.01 kA	(1) Add 1.8V, 1P10M2T2H, MIM and 32.5kA Metal option (2) Modify ILD1B from 0.415 to 0.462kA
			Non.	3.2.2.2 Option 1: 1P10M2T2H (1x,2x, 6x Metal) 3.2.3 Inter-layer Dielectric Thickness for MIMCAP	New Section
			3.3 Junction Depth Non	3.3 Junction Depth N+ Diffusion for 1.8V device 0.1 um P+ Diffusion for 1.8V device 0.1 um	Add 1.8V option

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0.2	1	05/10/2007	3.4 Interconnect Thickness Non.	3.4 Interconnect Thickness 3.4.1 FEOL Layers 3.4.2 BEOL layers 3.4.2-A UMC platform offering: 1P10M MIMTP 0.51 0.60 0.69 kA MIMBP 0.94 1.10 1.27 kA Metal10 (for 32.5kA thickness) 27.6 32.5 37.4 kA	Add MIM and 32.5kA Metal option
			Non.	3.4.2-B Option 1: 1P10M2T2H (1x,2x, 6x Metal) 6. Low Leakage Device with Low Threshold Voltage Option 7. 1.8V MOSFET Electrical Parameters	New Section
			6.1 2.5V NFET Electrical Parameters I _{off} (W/L=10/0.24, @VD=2.5V,VG=0V) -- 10 13 pA/um 7.2 3.3V PFET Electrical Parameters C _{j_area} (Vj=0V) 0.10 0.11 0.12 fF/um2	8.1 2.5V NFET Electrical Parameters I _{off} (W/L=10/0.24, @VD=2.5V,VG=0V) -- 10 128 pA/um 9.2 3.3V PFET Electrical Parameters C _{j_area} (Vj=0V) 1.0 1.1 1.2 fF/um2	Data update
			Non.	10.2 Thick Oxide Native NFET in P-Sub @1.8V V _{tlin} (W/L=10/1, @ID=300nA*W/L,VD=0.05V) TBD -0.178 TBD V V _{tsat} (W/L=10/1, @ID=300nA*W/L,VD=1.8V) TBD -0.242 TBD V I _{on} (W/L=10/1, @VD=VG=1.8V) TBD 445.7 TBD uA/um 10.4 Thick Oxide Native NFET in P-Sub @3.3V V _{tlin} (W/L=10/1, @ID=300nA*W/L,VD=0.05V) TBD -0.155 TBD V V _{tsat} (W/L=10/1.2, @ID=300nA*W/L,VD=3.3V) TBD -0.268 TBD V I _{on} (W/L=10/1.2, @VD=VG=3.3V) TBD 519.6 TBD uA/um	New Section
			9.1.1 Sheet resistance of Salicide and Metal Non.	11.1.1 Sheet resistance of Salicide and Metal 11.1.1.1 FEOL Lay 11.1.1.2 BEOL Layer 11.1.1.2-A UMC platform offering: 1P10M2T2F Metal10 (32.5kA thickness)sheet resistance 5.1 7.0 8.9 mOhm/sq Mvia7 resistance in MIMCAP 0.2 0.8 3 Ohm/mvia Mvia9 (32.5kA metal) resistance (0.6*0.6 um2) 0.1 0.13 3 Ohm/mvia 11.1.1.2-B Option 1: 1P10M2T2H 11.1.2.1 FEOL Layers 11.1.2.2-A UMC platform offering: 1P10M2T2F 11.1.2.2-B Option 1: 1P10M2T2H	(1) Add MIM and 32.5kA Metal option (2) Add 1P10M2T2H option
			Non.	12. MIMCAP (Metal Insulator Metal Capacitor)	New Section

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0.3	1	07/26/2007	3.4.2-A UMC platform offering: 1P10M (1x,2x,4x Metal) 3.4.2-B Option 1: 1P10M2T2H (1x,2x, 6x Metal) 4. Low Leakage Device with High Threshold Voltage Option (LL_HVT) Electrical Parameters 4.1 1.2V NFET Electrical Parameters Vtlin (W/L=1/0.06, @ID=300nA*W/L,VD=0.05V) 0.59 0.67 0.74 V Vtsat (W/L=1/0.06, @ID=300nA*W/L,VD= 1.2V) 0.44 0.52 0.59 V Ioff (W/L=1/0.06, @VD= 1.2 V,VG= 0 V) -- 16 125 pA/um Ioff (W/L=1/0.06, @VD= 1.2 V,VG= 0V,T=85°C) -- 252 1446 pA/um Vt-shift (Body Effect, W/L=1/0.06 @VB= 0,-1.2 V,VD= 0.05V) TBD 0.13 TBD Subthreshold Swing (W/L=1/0.06, @VD= 1.2 V,VB= 0V) TBD 86 TBD Jg_inv (W/L=5/5, 25fingers, @VG=1.2V, VD,VS grounded) 0.03 0.06 0.2 A/um² Coverl (VG=-0.5V) -- 0.22 --fF/um Ij (Vj=1.2V, T=25°C)--10 TBD fA/um² Ij (Vj=1.2V, T=85°C) -- TBD TBD fA/um² 4.2 1.2V PFET Electrical Parameters, in N-Well Tox_inv (@100kHz, VG=-1.2V, VB=0V) 27 28 29 A Vtlin(W/L=1/0.06,@ID=-70nA*W/L,VD=-0.05V) -0.54 -0.61 -0.67 V Vtsat (W/L=1/0.06, @ID=-70nA*W/L,VD=-1.2V) -0.43 -0.5 -0.56 V Ion (W/L=1/0.06, @VD=VG=-1.2V) -171 -210 -253 uA/um Ioff (W/L=1/0.06, @VD=-1.2V,VG=0V) -- -10 -40 pA/um Ioff (W/L=1/0.06, @VD=-1.2V,VG=0V,T=85°C) -- -149 -942 pA/um Vt-shift (Body Effect, W/L=1/0.06 @VB= 0, 1.2V,VD=-0.05V) TBD -0.13 TBD V Subthreshold Swing (W/L=1/0.06, @VD=-1.2V,VB=0V) TBD 85 TBD mV/dec Jg_inv (W/L=5/5, 25fingers, @VG=-1.2V, VD,VS grounded) 0.001 0.002 0.006 A/cm² Cj_area (Vj=0V) 11 1.3 1.4 fF/um² Coverl (VG=0.5V) -- 0.2 --fF/um Ij (Vj=-1.2V, T=25°C) -- -10 TBD fA/um² Ij (Vj=-1.2V, T=85°C) -- TBD TBD fA/um² 4.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2/0.06, PFET W/L=2*3/0.06, @ 1.2V) 12.7 15.8 19.8 psec/stage	3.4.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) 3.4.2.2 Option 1: 1P10M2T2H (1x,2x, 6x Metal) 4. Low Leakage Device with High Threshold Voltage Option (LL_HVT) Electrical Parameters 4.1 1.2V NFET Electrical Parameters Vtlin (W/L=1/0.06, @ID=300nA*W/L,VD=0.05V) 0.585 0.66 0.725 V Vtsat (W/L=1/0.06, @ID=300nA*W/L,VD= 1.2V) 0.434 0.51 0.575 V Ioff (W/L=1/0.06, @VD= 1.2 V,VG= 0 V) -- 16 122 pA/um Ioff (W/L=1/0.06, @VD= 1.2 V,VG= 0V,T=85°C) -- 290 1632 pA/um Vt-shift (Body Effect, W/L=1/0.06 @VB= 0,-1.2 V,VD= 0.05V) 0.10 0.11 0.12 V Subthreshold Swing (W/L=1/0.06, @VD= 1.2 V,VB= 0V) 79 88 97 mV/dec Jg_inv (W/L=5/5, 25fingers, @VG=1.2V, VD,VS grounded) 0.028 0.067 0.160 A/cm² Coverl (VG=-0.5V) -- 0.2 --fF/um Ij (Vj=1.2V, T=25°C)-- -- 10 fA/um² Non. 4.2 1.2V PFET Electrical Parameters, in N-Well Tox_inv (@100kHz, VG=-1.2V, VB=0V) 26.5 27.5 28.5 A Vtlin (W/L=1/0.06, @ID=-70nA*W/L,VD=-0.05V) -0.531 -0.6 -0.658 V Vtsat (W/L=1/0.06, @ID=-70nA*W/L,VD=-1.2V) -0.421 -0.49 -0.549 V Ion (W/L=1/0.06, @VD=VG=-1.2V) -173 -210 -252 uA/um Ioff (W/L=1/0.06, @VD=-1.2V,VG=0V) -- -10 -52 pA/um Ioff (W/L=1/0.06, @VD=-1.2V,VG=0V,T=85°C) -- -180 -811 pA/um Vt-shift (Body Effect, W/L=1/0.06 @VB= 0, 1.2V,VD=-0.05V) -0.187 -0.203 -0.215 V Subthreshold Swing (W/L=1/0.06, @VD=-1.2V,VB=0V) 89 99 109 mV/dec Jg_inv (W/L=5/5, 25fingers, @VG=-1.2V, VD,VS grounded) -0.0024 -0.0058 -0.0142 A/cm² Cj_area (Vj=0V)s 1.1 1.2 1.3 fF/um² Coverl (VG=0.5V) -- 0.18 -- fF/um Ij (Vj=-1.2V, T=25°C) -- -- -10 fA/um² Non. 4.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V) 12.703 15.731 19.804 psec/stage	(1) Data update (2) Deletelj T=85°C) (1) Data update (2) Deletelj T=85°C) Data update

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0.3	1	07/26/2007	5.Low Leakage Device with Regular Threshold Voltage Option (LL_RVT) Electrical Parameters 5.1 1.2V NFET Electrical Parameters Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) 0.47 0.54 0.61 V Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD=1.2V) 0.31 0.38 0.45 V Ion (W/L=1/0.06, @VD=VG=1.2V) 517 630 755 uA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V) -- 500 698 pA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V, T=85°C) -- 8.6 48.2 nA/um Subthreshold Swing (W/L=1/0.06, @VD=1.2V, VB=0V) TBD 88 TBD mV/dec Jg_inv (W/L=5/5, 25fingers, @VG=1.2V, VD, VS grounded) 0.03 0.06 0.18 A/cm2 Coverl (VG=-0.5V) --0.24 -- fF/um Ij (Vj=1.2V, T=25°C) -- -10 TBD fA/um2 Ij (Vj=1.2V, T=85°C) -- TBD TBD fA/um2	5.Low Leakage Device with Regular Threshold Voltage Option (LL_RVT) Electrical Parameters 5.1 1.2V NFET Electrical Parameters Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) 0.46 0.526 0.586 V Vtsat (W/L=1/0.06, @ID=300nA*W/L, VD=1.2V) 0.296 0.37 0.435 V Ion (W/L=1/0.06, @VD=VG=1.2V) 516 630 756 uA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V) -- 507 7290 pA/um Ioff (W/L=1/0.06, @VD=1.2V, VG=0V, T=85°C) -- 3.68 30 nA/um Subthreshold Swing (W/L=1/0.06, @VD=1.2V, VB=0V) 76.0 84.4 94.4 mV/dec Jg_inv (W/L=5/5, 25fingers, @VG=1.2V, VD, VS grounded) 0.0296 0.0729 0.181 A/cm2 Coverl (VG=-0.5V) --0.2 -- fF/um Ij (Vj=1.2V, T=25°C) -- -10 fA/um2 Non.	(1) Data update (2) Deletelj T=85°C)
			5.2 1.2V PFET Electrical Parameters Tox_inv (@100kHz, VG=-1.2V, VB=0V) 27 28 29 A Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V) -0.57 -0.5 -0.44 V Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V) -0.44 -0.37 -0.31 V Ion (W/L=1/0.06, @VD=VG=-1.2V) -252 -310 -373 uA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V) -- -200 -2010 pA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C) -- -4.2 -18.9 nA/um Subthreshold Swing (W/L=1/0.06, @VD=-1.2V, VB=0V) TBD -87 TBD mV/dec Jg_inv (W/L=5/5, 25fingers, @VG=-1.2V, VD, VS grounded) -0.001 -0.002 -0.006 A/cm2 Coverl (VG=0.5V) -- 0.24 -- fF/um Ij (Vj=-1.2V, T=25°C) -- -10 -- fA/um2 Ij (Vj=-1.2V, T=85°C) -- TBD TBD fA/um2	5.2 1.2V PFET Electrical Parameters Tox_inv (@100kHz, VG=-1.2V, VB=0V) 26.5 27.5 28.5 A Vtlin (W/L=1/0.06, @ID=-70nA*W/L, VD=-0.05V) -0.445 -0.492 -0.539 V Vtsat (W/L=1/0.06, @ID=-70nA*W/L, VD=-1.2V) -0.304 -0.369 -0.420 V9 Ion (W/L=1/0.06, @VD=VG=-1.2V) -254 -310 -371 uA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V) -- -197 -1870 pA/um Ioff (W/L=1/0.06, @VD=-1.2V, VG=0V, T=85°C) -- -2.8 -16.6 nA/um Subthreshold Swing (W/L=1/0.06, @VD=-1.2V, VB=0V) 82.9 92.1 101.3 mV/dec Jg_inv (W/L=5/5, 25fingers, @VG=-1.2V, VD, VS grounded) -0.0023 -0.0057 -0.015 A/cm2 Coverl (VG=0.5V) -- 0.2 -- fF/um Ij (Vj=-1.2V, T=25°C) -- -10 fA/um2 Non	(1) Data update (2) Deletelj T=85°C)
			5.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2/0.06, PFET W/L=2*3/0.06, @ 1.2V) 8.0 9.8 12.1 psec/stage	5.3 Gate Delay Delay Tim (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V) 8.202 9.704 11.70 psec/stage	Data update
			6. Low Leakage Device with Low Threshold Voltage Option (LL_LVT) Electrical Parameters Tox_inv (@100kHz, VG=-1.2V, VB=0V) 27 28 29 A 6.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2/0.06, PFET W/L=2*3/0.06, @ 1.2V)	6. Low Leakage Device with Low Threshold Voltage Option (LL_LVT) Electrical Parameters Tox_inv (@100kHz, VG=-1.2V, VB=0V) 26.5 27.5 28.5 A 6.3 Gate Delay Delay Tim (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V)	Data update

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0.3	1	07/26/2007	7. 1.8V MOSFET Electrical Parameters 7.1 1.8V NFET Electrical Parameters, in P-Sub Min. Typ. Max. Unit Vtlin (W/L=10/0.18, @ID=300nA*W/L,VD=0.05V)TBD 0.535TBD V Vtsat (W/L=10/0.18, @ID=300nA*W/L,VD=1.8V) TBD 0.47 TBD V Ion (W/L=10/0.18, @VD=VG=1.8V) TBD 600 TBD uA/um Ioff (W/L=10/0.18, @VD=1.8V,VG=0V) -- 5 TBD pA/um Ioff (W/L=10/0.18, @VD=1.8V,VG=0V,T=85°C) -- TBD TBDpA/um Vt-shift (Body Effect, W/L=10/0.18 @VB=0, -1.8V ,VD=0.05V) TBD TBD TBDV Subthreshold Swing (W/L=10/0.18, @VD=1.8V,VB=0V) TBD TBD TBD mV/dec Coverl (VG=-0.5V) -- TBD-- fF/um Ij (Vj=1.8V, T=25°C) -- TBD TBDfA/um2 Ij (Vj=1.8V, T=85°C) -- TBD TBD fA/um2 7.2 1.8V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Vtlin (W/L=10/0.18, @ID=-70nA*W/L,VD=-0.05V)TBD -0.43 TBD V Vtsat (W/L=10/0.18, @ID=-70nA*W/L,VD=-1.8V) TBD -0.39 TBD V Ion (W/L=10/0.18, @VD=VG=-1.8V) TBD -255 TBD uA/um Ioff (W/L=10/0.18, @VD=-1.8V,VG=0V) -- -10 TBDpA/um Ioff (W/L=10/0.18, @VD=-1.8V,VG=0V,T=85°C) -- TBD TBD pA/um Vt-shift (Body Effect, W/L=10/0.18 @VB=0, 1.8V,VD=-0.05V) TBD TBD TBD V Subthreshold Swing (W/L=10/0.18, @VD=-1.8V,VB=0V) TBD TBD TBDmV/dec Coverl (VG=0.5V) -- 0.26 -- fF/um Ij (Vj=-1.8V, T=25°C) -- TBD TBD fA/um2 Ij (Vj=-1.8V, T=85°C) -- TBD TBD fA/um2 7.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.18um, PFET W/L=2*3um/0.18um, @1.8V) TBD TBD TBD psec/stage	7. 1.8V MOSFET Electrical Parameters 7.1 1.8V NFET Electrical Parameters, in P-Sub Min. Typ. Max. Unit Vtlin (W/L=10/0.18, @ID=300nA*W/L,VD=0.05V) 0.464 0.534 0.607 V Vtsat (W/L=10/0.18, @ID=300nA*W/L,VD=1.8V) 0.397 0.47 0.546V Ion (W/L=10/0.18, @VD=VG=1.8V) 507 600 694uA/um Ioff (W/L=10/0.18, @VD=1.8V,VG=0V) -- 5 37pA/um Ioff (W/L=10/0.18, @VD=1.8V,VG=0V,T=85°C) -- 109 591pA/um Vt-shift (Body Effect, W/L=10/0.18 @VB=0, -1.8V ,VD=0.05V) 0.237 0.254 0.273V Subthreshold Swing (W/L=10/0.18, @VD=1.8V,VB=0V) 72.6 80.7 88.8 mV/dec Coverl (VG=-0.5V) -- 0.26-- fF/um Ij (Vj=1.8V, T=25°C) -- -- 1.0fA/um2 Non. 7.2 1.8V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Vtlin (W/L=10/0.18, @ID=-70nA*W/L,VD=-0.05V) -0.376 -0.424 -0.485 V Vtsat (W/L=10/0.18, @ID=-70nA*W/L,VD=-1.8V) -0.34 -0.385 -0.443 V Ion (W/L=10/0.18, @VD=VG=-1.8V) -215 -255 -294 uA/um Ioff (W/L=10/0.18, @VD=-1.8V,VG=0V) -- -12 -26pA/um Ioff (W/L=10/0.18, @VD=-1.8V,VG=0V,T=85°C) -- -221 -484pA/um Vt-shift (Body Effect, W/L=10/0.18 @VB=0, 1.8V,VD=-0.05V) -0.37 -0.40 -0.42V Subthreshold Swing (W/L=10/0.18, @VD=-1.8V,VB=0V) 75.0 83.3 91.6mV/dec Coverl (VG=0.5V) -- 0.23 -- fF/um Ij (Vj=-1.8V, T=25°C) -- TBD -0.1 fA/um2 Non. 7.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.18um, PFET W/L=2*3um/0.18um, @1.8V) 21.251 18.503 25.075 psec/stage	(1) Data update (2) Deletelj T=85°C)

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0.3	1	07/26/2007	8. 2.5V MOSFET Electrical Parameters 8.1 2.5V NFET Electrical Parameters, in P-Sub Min. Typ. Max. Unit Vtlin (W/L=10/0.24, @ID=300nA*W/L,VD=0.05V) 0.49 0.585 0.67 V Vtsat (W/L=10/0.24, @ID=300nA*W/L,VD=2.5V) 0.35 0.44 0.52 V Ion (W/L=10/0.24, @VD=VG=2.5V) 522 600 687 uA/um Ioff (W/L=10/0.24, @VD=2.5V,VG=0V) -- 10 128 pA/um Ioff (W/L=10/0.24, @VD=2.5V,VG=0V,T=85°C) -- 479 3168pA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, -2.5V,VD=0.05V) TBD TBD TBD V Subthreshold Swing (W/L=10/0.24, @VD=2.5V,VB=0V) TBD TBD TBD mV/dec Ij (Vj=2.5V, T=25°C) -- 10 TBD fA/um2 Ij (Vj=2.5V, T=85°C) -- TBD TBD fA/um2 8.2 2.5V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Vtlin (W/L=10/0.24, @ID=-70nA*W/L,VD=-0.05V) -0.45 -0.535 -0.62 V Vtsat (W/L=10/0.24, @ID=-70nA*W/L,VD=-2.5V) -0.39 -0.48 -0.56 V Ion (W/L=10/0.24, @VD=VG=-2.5V) -240 -275 -317 uA/um Ioff (W/L=10/0.24, @VD=-2.5V,VG=0V) -- -3 -127 pA/um Ioff (W/L=10/0.24, @VD=-2.5V,VG=0V,T=85°C) -- -143 -996 pA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, 2.5V,VD=-0.05V) TBD TBD TBD V Subthreshold Swing (W/L=10/0.24, @VD=-2.5V,VB=0V) TBD TBD TBD mV/dec Coverl (VG=0.5V) -- 0.24 -- fF/um Ij (Vj=-2.5V, T=25°C) -- -1 TBD fA/um2 Ij (Vj=-2.5V, T=85°C) -- TBD TBD fA/um2 8.3 Gate Delay Delay Time 20.4 22.6 25.1 psec/stage	8. 2.5V MOSFET Electrical Parameters 8.1 2.5V NFET Electrical Parameters, in P-Sub Min. Typ. Max. Unit Vtlin (W/L=10/0.24, @ID=300nA*W/L,VD=0.05V) 0.493 0.579 0.659 V Vtsat (W/L=10/0.24, @ID=300nA*W/L,VD=2.5V) 0.351 0.44 0.521 V Ion (W/L=10/0.24, @VD=VG=2.5V) 522 600 690 uA/um Ioff (W/L=10/0.24, @VD=2.5V,VG=0V) -- 10 161pA/um Ioff (W/L=10/0.24, @VD=2.5V,VG=0V,T=85°C) -- 211 2130pA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, -2.5V,VD=0.05V) -71 -78.9 -86.8 V Subthreshold Swing (W/L=10/0.24, @VD=2.5V,VB=0V) 0.24 0.26 0.28 mV/dec Ij (Vj=2.5V, T=25°C) -- -- 1.0 fA/um2 Non. 8.2 2.5V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Vtlin (W/L=10/0.24, @ID=-70nA*W/L,VD=-0.05V) -0.445 -0.536 -0.615V Vtsat (W/L=10/0.24, @ID=-70nA*W/L,VD=-2.5V) -0.381 -0.471 -0.551V Ion (W/L=10/0.24, @VD=VG=-2.5V) -240 -275 -316 uA/um Ioff (W/L=10/0.24, @VD=-2.5V,VG=0V) -- -3 -30pA/um Ioff (W/L=10/0.24, @VD=-2.5V,VG=0V,T=85°C) -- -51 -399 pA/um Vt-shift (Body Effect, W/L=10/0.24 @VB=0, 2.5V,VD=-0.05V) 0.6 0.62 0.64 V Subthreshold Swing (W/L=10/0.24, @VD=-2.5V,VB=0V) 82.3 92.0 101.2TBD mV/dec Coverl (VG=0.5V) -- 0.23 -- fF/um Ij (Vj=-2.5V, T=25°C) -- -- -0.1 fA/um2 Non. 8.3 Gate Delay Delay Time 21.081 23.270 25.808 psec/stage	(1) Data update (2) Deletelj T=85°C)
			10.1 Thin Oxide Native NFET in P-Sub @1.2V Vtlin (W/L=1/0.2, @ID=300nA*W/L,VD=0.05V) 0.065 0.142 0.22 V Vtsat (W/L=1/0.2, @ID=300nA*W/L,VD=1.2V) 0.003 0.08 0.156 V Ion (W/L=1/0.2, @VD=VG=1.2V) 509 640 769 uA/um 10.2 Thick Oxide Native NFET in P-Sub @1.8V Vtlin (W/L=10/1, @ID=300nA*W/L,VD=0.05V) TBD -0.178 TBD V Vtsat (W/L=10/1, @ID=300nA*W/L,VD=1.8V) TBD -0.242 TBD V Ion (W/L=10/1, @VD=VG=1.8V)TBD 445.7 TBD 10.3 Thick Oxide Native NFET in P-Sub @2.5V 10.4 Thick Oxide Native NFET in P-Sub @3.3V	10.1 1.2V Thin Oxide Native NFET in P-Sub Vtlin (W/L=1/0.2, @ID=300nA*W/L,VD=0.05V) 0.03 0.11 0.183V Vtsat (W/L=1/0.2, @ID=300nA*W/L,VD=1.2V) -0.032 0.042 0.11 V Ion (W/L=1/0.2, @VD=VG=1.2V) 535 667 798 uA/um 10.2 1.8V Thick Oxide Native NFET in P-Sub Vtlin (W/L=10/1, @ID=300nA*W/L,VD=0.05V) -0.099 -0.18 -0.264 V Vtsat (W/L=10/1, @ID=300nA*W/L,VD=1.8V) -0.158 -0.244 -0.33 V Ion (W/L=10/1, @VD=VG=1.8V) 364.0 436.9 510.3 10.3 2.5V Thick Oxide Native NFET in P-Sub 10.4 3.3V Thick Oxide Native NFET in P-Sub	Data update

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0.3	1	07/26/2007	Non.	11. NCAP (NFET in N-well Capacitor)	New Section
			11.1.1.1 FEOL Layer Min. Typ. Max. Unit N+ sheet resistance between two Poly lines (S= 0.13 um) TBD TBD TBD Ohm/sq P+ sheet resistance between two Poly lines (S= 0.13 um) TBD TBD TBD Ohm/sq 11.1.1.2-A UMC platform offering: 1P10M2T2F (1x,2x,4x Metal) 11.1.1.2-B Option: 1P10M2T2H (1x,4x,6x Metal)	12.1.1.1 FEOL Layer Min. Typ. Max. Unit N+ sheet resistance between two Poly lines (S= 0.13 um) 9 32 55 Ohm/sq P+ sheet resistance between two Poly lines (S= 0.13 um) 10 27 44 Ohm/sq 12.1.1.2.1 UMC platform offering: 1P10M2T2F (1x,2x,4x Metal) 12.1.1.2.2 Option: 1P10M2T2H (1x,4x,6x Metal)	Data update
			11.1.2 Temperature Coefficient of Resistors R0: room temperature (25°C) resistance; refer to 8.1.1 11.1.2.1 FEOL Layers TCR Unit N+ Diffusion sheet resistance 2.5E-03 1/°C P+ Diffusion sheet resistance 2.8E-03 1/°C N+Poly sheet resistance 2.8E-03 1/°C P+Poly sheet resistance 3.0E-03 1/°C 11.1.2.2-A UMC platform offering: 1P10M2T2F (1x,2x,4x Metal) 11.1.2.2-B Option: 1P10M2T2H (1x,4x,6x Metal)	12.1.2 Temperature Coefficient of Resistors R0: room temperature (25°C) resistance; refer to 12.1.1 12.1.2.1 FEOL Layers TCR Unit N+ Diffusion sheet resistance 1.7E-03 1/°C P+ Diffusion sheet resistance 2.0E-03 1/°C N+Poly sheet resistance 1.7E-03 1/°C P+Poly sheet resistance 2.2E-03 1/°C 12.1.2.2.1 UMC platform offering: 1P10M2T2F (1x,2x,4x Metal) 12.1.2.2.2 Option: 1P10M2T2H (1x,4x,6x Metal)	Data update
			11.2 Non-salicide Resistances Min. Typ. Max. Unit N+ Diffusion sheet resistance 88 103 118 Ohm/sq P+ Diffusion sheet resistance 103 137 171 Ohm/sq N+ Poly sheet resistance 161 214 268 Ohm/sq P+ Poly sheet resistance 342 402 462 Ohm/sq	12.2 Non-salicide Resistances Min. Typ. Max. Unit N+ Diffusion sheet resistance 81 95 109 Ohm/sq P+ Diffusion sheet resistance 97 129 161 Ohm/sq N+ Poly sheet resistance 169 225 281 Ohm/sq P+ Poly sheet resistance 327 385 443 Ohm/sq	Data update
			11.3.1 Non-salicide N+ Diffusion Resistor Min. Typ. Max. Unit N+ Diffusion Rs 87 102 117 Ohm/sq 11.3.2 Non-salicide P+ Poly Resistor Min. Typ. Max. Unit P+ Poly Rs 337 396 455 Ohm/sq 11.4.1 Sheet resistance of N-well TCR : Temperature Coefficient (=TBD/°C)	12.3.1 Non-salicide N+ Diffusion Resistor Min. Typ. Max. Unit N+ Diffusion Rs 81 95 109 Ohm/sq 12.3.2 Non-salicide P+ Poly Resistor Min. Typ. Max. Unit P+ Poly Rs 327 385 443 Ohm/sq 12.4.1 Sheet resistance of N-well TCR : Temperature Coefficient (=1/°C)	Data update
			12.1 MIMCAP Electrical Parameters Min. Typ. Max. Unit Cp (Perimeter Component of Capacitance) -- 0.128 -- fF/um	13.1 MIMCAP Electrical Parameters Min. Typ. Max. Unit Cp (Perimeter Component of Capacitance) -- 0.064 -- fF/um	Data update

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1.0	1	04/07/2008	3.2.2.1 UMC platform offering: 1P10M2T2F (1x,2x,4x Metal) 3.2.2.2 Option 1: 1P10M2T2H (1x,2x, 6x Metal) 3.4.2.2 Option 1: 1P10M2T2H (1x,2x, 6x Metal)	3.2.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) 3.2.2.2 Option 1: 1P10M (1x,2x, 6x Metal) 3.4.2.2 Option 1: 1P10M (1x,2x, 6x Metal)	Align G-04
			3.2.3 Inter-layer Dielectric Thickness for MIMCAP MIMTP Metal 7 1.94 2.43 2.91 kA MIMBP 0.220 0.275 0.330 kA Metal 8 MIMTP 2.34 2.85 3.51 kA	3.2.3 Inter-layer Dielectric Thickness for MIMCAP MIMTP Metal 7 1.98 2.48 2.97 kA MIMBP 0.264 0.330 0.396 kA Metal 8 MIMTP 2.29 2.87 3.44 kA	Pure SiN for MIMCAP
			4. Low Leakage Device with High Threshold Voltage Option (LL_HVT) Electrical Parameters 4.1 1.2V NFET Electrical Parameters Is _{sub} (W/L=1/0.06; Maximum)-- TBD-- nA/um V _t -shift 0.10 0.11 0.12V Subthreshold Swing 79 88 97 mV/dec C _j _area (V _j =0V) 1.4 1.6 1.8 fF/um ² Coverl (V _G =-0.5V) -- 0.2 --fF/um 4.2 1.2V PFET Electrical Parameters Is _{sub} (W/L=1/0.06; Maximum)-- TBD--nA/um V _t -shift -0.187 -0.203 -0.215V Subthreshold Swing 89 99 109mV/dec C _j _area (V _j =0V)s 1.1 1.2 1.3 fF/um ² Coverl (V _G =0.5V) -- 0.18 -- fF/um 4.3 Gate Delay Delay Time 12.703 15.731 19.804 psec/stage	4. Low Leakage Device with High Threshold Voltage Option (LL_HVT) Electrical Parameters 4.1 1.2V NFET Electrical Parameters Is _{sub} (W/L=1/0.06; Maximum)-- -10-- nA/um V _t -shift 0.0350.11 0.175V Subthreshold Swing 75.1 88.3 101.6mV/dec Non. 4.2 1.2V PFET Electrical Parameters Is _{sub} (W/L=1/0.06; Maximum)-- 51--pA/um V _t -shift -0.145-0.203 -0.272V Subthreshold Swing 80.8 95.1 109.4mV/dec Non. 4.3 Gate Delay Delay Time 12.4 15.7 18.8 psec/stage	(1) Data update (2) Delete C _j _area, Coverl
			5.Low Leakage Device with Regular Threshold Voltage Option (LL_RVT) Electrical Parameters 5.1 1.2V NFET Electrical Parameters, in P-Sub Is _{sub} -- TBD -- nA/um V _t -shift TBD 0.07 TBD V Subthreshold Swing 76.0 84.4 94.4 mV/dec C _j _area (V _j =0V) 1.2 1.3 1.4 fF/um ² Coverl (V _G =-0.5V) -- 0.22 -- fF/um 5.2 1.2V PFET Electrical Parameters, in N-Well V _{tsat} -0.304 -0.369 -0.429V Ion -254 -310 -371 uA/um Is _{sub} -- TBD-- nA/um V _t -shift TBD -0.136 TBD V Subthreshold Swing 82.9 92.2 101.3 mV/dec C _j _area (V _j =0V) 1.1 1.2 1.3 fF/um ² Coverl (V _G =0.5V) -- 0.2 -- fF/um 5.3 Gate Delay Delay Time 8.202 9.704 11.7	5.Low Leakage Device with Regular Threshold Voltage Option (LL_RVT) Electrical Parameters 5.1 1.2V NFET Electrical Parameters, in P-Sub Is _{sub} -- -15 -- nA/um V _t -shift 0.01 0.07 0.131 V Subthreshold Swing 72.3 85.0 97.8mV/dec Non. 5.2 1.2V PFET Electrical Parameters, in N-Well V _{tsat} -0.301 -0.36 -0.427V Ion -253 -310 -370 uA/um Is _{sub} -- 65 -- pA/um V _t -shift -0.087 -0.136 -0.181 V Subthreshold Swing 78.9 92.8 106.7 mV/dec Non. 5.3 Gate Delay Delay Time 8.2 9.7 11.7	(1) Data update (2) Delete C _j _area, Coverl

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1.0	1	04/07/2008	6.Low Leakage Device with Low Threshold Voltage Option (LL_LVT) Electrical Parameters 6.1 1.2V NFET Electrical Parameters Vtlin TBD 0.47 TBD V Vtsat TBD 0.3 TBD V Ion TBD 730 TBD uA/um Ioff -- 5000 TBD pA/um Ioff (T=85°C) -- TBD TBD nA/um Isub -- TBD -- nA/um Vt-shift TBD TBD TBD V Subthreshold Swing TBD TBD TBD mV/dec Jg_inv TBD TBD TBD A/um2 Cj_area (Vj=0V) 1.1 1.2 1.3 fF/um2 Coverl (VG=-0.5V) -- 0.24 -- fF/um Ij (Vj=1V, T=25°C) -- TBD TBD fA/um2 Ij (Vj=1V, T=85°C) -- TBD TBD fA/um2 6.2 1.2V PFET Electrical Parameters Vtlin TBD -0.44 TBD V Vtsat TBD -0.3 TBD V Ion TBD -365 TBD uA/um Ioff -- -1500 TBD pA/um Ioff (T=85°C) -- TBD TBD nA/um Isub -- TBD -- nA/um Vt-shift TBD TBD TBD V Subthreshold Swing TBD TBD TBD mV/dec Jg_inv TBD TBD TBD A/cm2 Cj_area (Vj=0V) 1.0 1.1 1.2 fF/um2 Coverl (VG=0.5V) -- 0.24 -- fF/um Ij (Vj=-1.2V, T=25°C) -- TBD TBD fA/um2 Ij (Vj=-1.2V, T=85°C) -- TBD TBD fA/um2 6.3 Gate Delay Delay Time TBD TBD TBDpsec/stage	6.Low Leakage Device with Low Threshold Voltage Option (LL_LVT) Electrical Parameters 6.1 1.2V NFET Electrical Parameters Vtlin 0.375 0.450 0.516V Vtsat 0.205 0.280 0.345 V Ion 583 730 876 uA/um Ioff -- 5 53 nA/um Ioff (T=85°C) -- 34 194 nA/um Isub -- -18-- nA/um Vt-shift 0.01 0.049 0.115 V Subthreshold Swing 71.4 84.0 96.6 mV/dec Jg_inv 0.0296 0.0729 0.181A/cm2 Non. Ij (Vj=1V, T=25°C) -- -- 10 fA/um2 Non. 6.2 1.2V PFET Electrical Parameters Vtlin -0.365 -0.43 -0.492 V Vtsat -0.225 -0.29 -0.35 V Ion -295-365 -438uA/um Ioff -- -1.5 -13.8 nA/um Ioff (T=85°C) -- -12.9 -69nA/um Isub -- 72-- pA/um Vt-shift -0.018 -0.08 -0.145 V Subthreshold Swing 80.6 94.9 109.1mV/dec Jg_inv -0.0023 -0.0057 -0.015 A/cm2 Non. Ij (Vj=-1.2V, T=25°C) -- -- -10fA/um2 Non. 6.3 Gate Delay Delay Time 6.8 8.1 10.0 psec/stage	(1) Data update (2) Deletelj T=85°C, Cj_area, Coverl
			7. 1.8V MOSFET Electrical Parameters 7.1 1.8V NFET, in P-Sub Isub -- TBD -- uA/u Vt-shift 0.237 0.254 0.273 V Subthreshold Swing 72.6 80.7 88.8 mV/dec Vbd_ox TBD -- -- V Vbd TBD -- -- V Ij -- -- 1.0 fA/um2 7.2 1.8V PFET, in N-Well Isub -- TBD -- uA/um Vt-shift -0.37 -0.40 -0.42 V Subthreshold Swing 75.0 83.3 91.6 mV/dec Vbd_oxTBD -- -- V Vbd TBD -- -- V Ij -- -- -0.1 fA/um2 7.3 Gate Delay Delay Time 18.503 21.251 25.075 psec/stage	7. 1.8V MOSFET Electrical Parameters 7.1 1.8V NFET, in P-Sub Isub -- -123 -- nA/u Vt-shift 0.184 0.254 0.327 V Subthreshold Swing 68.6 80.7 92.8 mV/dec Vbd_ox 4.1 -- -- V Vbd 4.0 -- -- V Ij -- -- 10 fA/um2 7.2 1.8V PFET, in N-Well Isub -- 1 -- nA/um Vt-shift -0.339 -0.40 -0.448 V Subthreshold Swing 68.0 80.0 92.0 mV/dec Vbd_ox -6.0 -- -- V Vbd -3.9 -- -- V Ij -- -- -10 fA/um2 7.3 Gate Delay Delay Time 17.1 19.6 23.1 psec/stage	Data update

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.0	1	04/07/2008	8. 2.5V MOSFET Electrical Parameters 8.1 2.5V, in P-Sub Vtlin 0.493 0.579 0.659 V Isub -- 0.78 -- uA/um Vt-shift 0.24 0.26 0.28 V Subthreshold Swing 71 78.9 86.8 mV/dec Vbd_ox TBD -- -- V Vbd TBD -- -- V Ij-- -- 1.0 fA/um2 8.2 2.5V, in N-Well Vtlin -0.445 -0.536 -0.615 V Vtsat -0.381 -0.471 -0.551 V Ioff -- -3 -30 pA/um Ioff (T=85°C) -- -51 -399 pA/um Isub -- TBD -- uA/um Vt-shift -0.6 -0.62 -0.64 V Subthreshold Swing 82.3 92.0 101.2 mV/dec Vbd_ox TBD -- -- V Vbd TBD -- -- V Ij-- -- -0.1 fA/um2 8.3 Gate Delay Delay Time 21.081 23.270 25.808 psec/stage	8. 2.5V MOSFET Electrical Parameters 8.1 2.5V, in P-Sub Vtlin 0.493 0.58 0.659 V Isub -- -782 -- nA/um Vt-shift 0.174 0.26 0.34 V Subthreshold Swing 67.3 79.1 91.0 mV/dec Vbd_ox 7.1 -- -- V Vbd 8.1 -- -- V Ij -- -- 10 fA/um2 8.2 2.5V, in N-Well Vtlin -0.445 -0.53 -0.615 V Vtsat -0.381-0.475 -0.551 V Ioff -- -4.4 -35 pA/um Ioff (T=85°C) -- -52 -404 pA/um Isub -- 24 -- nA/um Vt-shift -0.541 -0.62 -0.711 V Subthreshold Swing 82.375.3 88.6 101.8 mV/dec Vbd_ox -9.5 -- -- V Vbd -5.2 -- -- V Ij-- -- -10 fA/um2 8.3 Gate Delay Delay Time 21.1 23.3 25.8 psec/stage	Data update
			9. 3.3V MOSFET Electrical Parameters 9.1 3.3V NFET, in P-Sub Vtlin 0.48 0.57 0.65 V Vtsat 0.41 0.5 0.58 V Ioff -- 1 13 pA/um Isub -- TBD -- uA/um Vt-shift TBD TBD TBD V Subthreshold Swing TBD TBD TBD mV/dec Vbd_ox TBD -- -- V Vbd TBD -- -- V Ij -- TBD TBD fA/um2 9.2 3.3V PFET, in N-Well Min. Typ. Max. Unit Vtlin -0.56 -0.645 -0.73 V Vtsat -0.52 -0.6 -0.69 V Ion -226 -260 -299 uA/um Isub -- TBD -- uA/um Vt-shift TBD TBD TBD V Subthreshold Swing TBD TBD TBD mV/dec Vbd_ox TBD -- -- V Vbd TBD -- -- V Ij -- TBD TBD fA/um2 9.3 Gate Delay Delay Time 31.7 35.9 40.8 psec/stage	9. 3.3V MOSFET Electrical Parameters 9.1 3.3V NFET, in P-Sub Vtlin 0.471 0.56 0.640 V Vtsat 0.40 0.49 0.57 V Ioff -- 1 15.4 pA/um Isub -- -2.73 -- uA/um Vt-shift 0.397 0.5 0.591 V Subthreshold Swing 61.6 72.4 83.3 mV/dec Vbd_ox 8.2 -- -- V Vbd 7.7 -- -- V Ij -- -- 10 fA/um2 9.2 3.3V PFET, in N-Well Min. Typ. Max. Unit Vtlin -0.534 -0.625 -0.706 V Vtsat -0.50 -0.59 -0.67 V Ion -225 -260 -299 uA/um Isub -- 185 -- nA/um Vt-shift -0.825 -0.91 -1.006 V Subthreshold Swing 77.0 90.6 104.2 mV/dec Vbd_ox -11.0 -- -- V Vbd -6.5 -- -- V Ij -- -- 10 fA/um2 9.3 Gate Delay Delay Time 31.0 35.0 39.6 psec/stage	Data update
			10.3 2.5V Thick Oxide Native NFET in P-Sub Vtlin (W/L=10/1.2, @ID=300nA*W/L,VD=0.05V) -0.266 -0.156 -0.046 V Vtsat (W/L=10/1.2, @ID=300nA*W/L,VD=2.5V) -0.353 -0.246 -0.139 V Ion (W/L=10/1.2, @VD=VG=2.5V) 345 430.3 515 uA/um	10.3 2.5V Thick Oxide Native NFET in P-Sub Vtlin (W/L=10/1.2, @ID=300nA*W/L,VD=0.05V) -0.045-0.156 -0.264V Vtsat (W/L=10/1.2, @ID=300nA*W/L,VD=2.5V) -0.129 -0.24-0.343V Ion (W/L=10/1.2, @VD=VG=2.5V) 345 431.5 515 uA/um	Data update
			10.4 3.3V Thick Oxide Native NFET in P-Sub Vtlin (W/L=10/1.2, @ID=300nA*W/L,VD=0.05V) TBD -0.155 TBD V Vtsat (W/L=10/1.2, @ID=300nA*W/L,VD=3.3V) TBD -0.268 TBD V Ion (W/L=10/1.2, @VD=VG=3.3V) TBD 519.6 TBD uA/um	10.4 3.3V Thick Oxide Native NFET in P-Sub Vtlin (W/L=10/1.2, @ID=300nA*W/L,VD=0.05V) -0.029 -0.16 -0.291 V Vtsat (W/L=10/1.2, @ID=300nA*W/L,VD=3.3V) -0.135 -0.266-0.391 V Ion (W/L=10/1.2, @VD=VG=3.3V) 421 525.2 631uA/um	
			11. NCAP (NFET in N-well Capacitor)	Non.	Delete NCAP section

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.0	1	04/07/2008	12.1.1 Sheet resistance of Salicide and Metal N+ contact resistance 10 25 50 Ohm/cont P+ contact resistance 9 23 46 Ohm/cont N+ Poly contact resistance 9 26 52 Ohm/cont P+ Poly contact resistance 9 26 52 Ohm/cont 12.1.1.2.1 UMC platform offering: 1P10M2T2F (1x,2x,4x Metal) 12.1.1.2.2 Option: 1P10M2T2H (1x,4x,6x Metal) 12.1.2.2.1 UMC platform offering: 1P10M2T2F (1x,2x,4x Metal) 12.1.2.2.2 Option: 1P10M2T2H (1x,4x,6x Metal) 12.1.2 Temperature Coefficient of Resistors R0: room temperature (25°C) resistance; refer to 12.1.1	11.1.1 Sheet resistance of Salicide and Metal N+ contact resistance 11 35 75 Ohm/cont P+ contact resistance 11 35 75 Ohm/cont N+ Poly contact resistance 7 30 65 Ohm/cont P+ Poly contact resistance 7 30 65 Ohm/cont 11.1.1.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) 11.1.1.2.2 Option: 1P10M (1x,4x,6x Metal) 11.1.2.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) 11.1.2.2.2 Option: 1P10M (1x,4x,6x Metal) 11.1.2 Temperature Coefficient of Resistors R0: room temperature (25°C) resistance; refer to 11.1.1	Data update
			13.1 MIMCAP Electrical Parameters Ca 1.62 1.91 2.20 fF/um2 Cp -- 0.064 -- fF/um Rs_bot 2.4 3.7 5.0 mOhm/sq TCR -- -12 -- ppm/°C VC1 -- -52.6 -- ppm/V VC2 -- -17.8 -- ppm/V2	12.1 MIMCAP Electrical Parameters Ca 1.70 2.00 2.30 fF/um2 Cp -- 0.058 -- fF/um Rs_bot 2.4 3.7 5.0 Ohm/sq TCR1 -- 16.7 -- ppm/°C TCR2 -- -0.0051 -- ppm/°C2 VC1 -- 46.5 -- ppm/V VC2 -- -20.4 -- ppm/V2	Pure SiN for MIMCAP

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.1	1	08/04/2008	4.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V) 12.4 15.7 18.8 psec/stage 5.1 1.2V NFET Electrical Parameters, in P-Sub Vtlin (W/L=1/0.06, @ID=300nA*W/L,VD=0.05V) 0.46 0.526 0.586 V loff (W/L=1/0.06, @VD=1.2V,VG=0V) -- 507 7290 pA/um 5.2 1.2V PFET Electrical Parameters, in N-Well Vtlin (W/L=1/0.06, @ID=-70nA*W/L,VD=-0.05V) -0.445 -0.492 -0.539 V loff (W/L=1/0.06, @VD=-1.2V,VG=0V) -- -197 -1870 pA/um 5.3 Gate Delay PFET W/L=2*0.75/0.06, @ 1.2V) 8.2 9.7 11.7 psec/stage 7.1 1.8V NFET Electrical Parameters, in P-Sub Vtlin (W/L=10/0.18, @ID=300nA*W/L,VD=0.05V) 0.464 0.534 0.607 V 7.2 1.8V PFET Electrical Parameters, in N-Well Vtlin (W/L=10/0.18, @ID=-70nA*W/L,VD=-0.05V) -0.376 -0.424 -0.485 V loff (W/L=10/0.18, @VD=-1.8V,VG=0V) -- -12 -26 pA/um 7.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.18um, PFET W/L=2*3um/0.18um, @ 1.8V) 17.1 19.7 23.1 psec/stage 8.2 2.5V PFET Electrical Parameters, in N-Well loff (W/L=10/0.24, @VD=-2.5V,VG=0V) -- -4.4 -35 pA/um 11.1.1.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) Metal10 (32.5kA thickness)sheet resistance (W= 2um) 5.1 7.0 8.9 mOhm/sq AL_RDL(L2) sheet resistance (W= 3 um) 18 30 50 mOhm/sq	4.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*0.5/0.06, PFET W/L=2*0.75/0.06, @ 1.2V) 12.4 15.1 18.8 psec/stage 5.1 1.2V NFET Electrical Parameters, in P-Sub Vtlin (W/L=1/0.06, @ID=300nA*W/L,VD=0.05V) 0.46 0.5250.586 V loff (W/L=1/0.06, @VD=1.2V,VG=0V) -- 500 7290 pA/um 5.2 1.2V PFET Electrical Parameters, in N-Well Vtlin (W/L=1/0.06, @ID=-70nA*W/L,VD=-0.05V) -0.445 -0.49-0.539 V loff (W/L=1/0.06, @VD=-1.2V,VG=0V) -- -200-1870 pA/um 5.3 Gate Delay PFET W/L=2*0.75/0.06, @ 1.2V) 8.2 9.8 11.7 psec/stage 7.1 1.8V NFET Electrical Parameters, in P-Sub Vtlin (W/L=10/0.18, @ID=300nA*W/L,VD=0.05V) 0.464 0.5350.607 V 7.2 1.8V PFET Electrical Parameters, in N-Well Vtlin (W/L=10/0.18, @ID=-70nA*W/L,VD=-0.05V) -0.376 -0.425-0.485 V loff (W/L=10/0.18, @VD=-1.8V,VG=0V) -- -10 -26 pA/um 7.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.18um, PFET W/L=2*3um/0.18um, @ 1.8V) 17.1 19.6 23.1 psec/stage 8.2 2.5V PFET Electrical Parameters, in N-Well loff (W/L=10/0.24, @VD=-2.5V,VG=0V) -- -3.0-35 pA/um 11.1.1.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) Metal10 (32.5kA thickness)sheet resistance (W= 2um) 3.6 5.0 6.4 mOhm/sq AL_RDL(L2) sheet resistance (W= 3 um) 13 22 36 mOhm/sq	

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1.1	1	08/04/2008	11.1.1.2.2 Option: 1P10M (1x,4x,6x Metal) AL_RDL(L2) sheet resistance (W= 3 um) 18 30 50 mOhm/sq 11.4 N-well Resistor 11.4.1 Sheet resistance of N-well Min. Typ. Max. Unit RSNWELL (L=40um,W=10um) 476 595 714 Ohm/sq The N-well Resistance is given by : $R = R_s(NW) \times \left(\frac{L}{W + \Delta W} \right) \times [1 + TCR \times (T - 25)]$ Where: R : N-well Resistance in Ohm Rs(NW) : Sheet Resistance of the N-well under STI (=TBD Ohm/sq) L : Design Length in um W : Design Width in um (W larger than 2um is recommended to decrease resistance variation of width dependence) ΔW : Width Bias, TBD um T : Temperature in °C TCR : Temperature Coefficient (=1/°C)	11.1.1.2.2 Option: 1P10M (1x,4x,6x Metal) AL_RDL(L2) sheet resistance (W= 3 um) 13 22 36 mOhm/sq 11.4 N-well Resistor 11.4.1 Sheet resistance of N-well Min. Typ. Max. Unit RSNWELL (L=40um,W=10um) 476 595 714 Ohm/sq The N-well Resistance is given by : $R = R_s(NW) \times \left(\frac{L}{W + \Delta W} \right) \times [1 + TCR1(T - 25) + TCR2(T - 25)^2]$ Where: R : N-well Resistance in Ohm Rs(NW) : Sheet Resistance of the N-well under STI (=577 Ohm/sq) L : Design Length in um W : Design Width in um (W larger than 2um is recommended to decrease resistance variation of width dependence) ΔW : Width Bias, -0.31 um T : Temperature in °C TCR1 : Linear temperature coefficient of resistor , 1.58E-3 /°C TCR2 : Quadratic temperature coefficient of resistor, 8.62E-6 /°C²	
1.2	1	01/21/2009	11.1.1.2 BEOL Layer Mvia9 (32.5kA metal) resistance (0.6*0.6 um2) 0.1 0.13 3 Ohm/mvia 12.1MIMCAP Electrical Parameters Rs_bot (Sheet resistance of bottom plate (W=2.8um) 2.4 3.7 5.0 Ohm/sq Rc_Via_bot (bottom plate Via Resistance, 0.2*0.2 um2) 3.2 5.2 7.2 Ohm/Via Rc_Via_top (top plate Via Resistance, 0.2*0.2 um2) 10.6 12.8 15 Ohm/Via	8. 2.5V MOSFET Electrical Parameters Add 8.2 2.5V Operated at 3.3V MOSFET Device Electrical Parameters 8.2.1 2.5V Operated at 3.3V NFET Electrical Parameters, in P-Sub Min. Typ. Max. Unit Vtlin (W/L=10/0.5, @ID=300nA*W/L, VD=0.05V) 0.575 0.646 0.711 V Vtsat (W/L=10/0.5, @ID=300nA*W/L, VD=3.3V) 0.532 0.603 0.666 V Ion (W/L=10/0.5, @VD=VG=3.3V) 510 571 634 uA/um Ioff (W/L=10/0.5, @VD=3.3V, VG=0V) -- 0.06 0.29 pA/um 8.2.2 2.5V Operated at 3.3V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Vtlin (W/L=10/0.28, @ID=-70nA*W/L, VD=-0.05V) -0.498 -0.574 -0.640 V Vtsat (W/L=10/0.28, @ID=-70nA*W/L, VD=-3.3V) -0.460 -0.536 -0.601 V Ion (W/L=10/0.28, @VD=VG=-3.3V) -238.5 -264.6 -292.1 uA/um Ioff (W/L=10/0.28, @VD=-3.3V, VG=0V) -- -11.1 -25.3 pA/um 8.2.3 Gate Delay Delay Time (without loading, 65 stages, NFET W/L=2*2um/0.5um, PFET W/L=2*3um/0.4um, @ 3.3V)	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.2	1	01/21/2009	-	44.4 47.2 50.7 psec/stage 11.1.1.2 BEOL Layer Mvia9 (32.5kA metal) resistance (0.6*0.6 um²) 0.03 0.1 1 Ohm/mvia add 11.3.3 Non Salicide HR POLY Resistor Where: R: total resistance in ohm Ro: intrinsic resistance at 25°C in ohm Rs: sheet resistance at 25°C in ohm/sq Rend: end resistance at 25°C in ohm*um W: designed non-salicide resistor width in um L: designed non-salicide resistor SAB length in um ΔW: deviation of designed resistor width bias at 25°C in um ΔL: deviation of designed resistor length bias at 25°C in um V: bias voltage across resistor VCR1: linear voltage coefficient of resistor in m/V for HR POLY resistor VCR2: quadratic voltage coefficient of resistor in m²/V² for HR POLY resistor T: device temperature in °C To: nominal device temperature in °C (To = 25 °C) TCR1: linear temperature coefficient of resistor in 1/°C	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.2	1	01/21/2009	-	TCR2: quadratic temperature coefficient of resistor in $1/^{\circ}\text{C}^2$ Min. Typ. Max. Unit HR POLY Rs 894 1052 1210 Ohm/sq HR POLY Rend 204 229 254 Ohm * um HR POLY ΔW -0.0257 -0.019 -0.0123 um HR POLY ΔL -- 0.76 -- um HR POLY VCR1 -- 0 -- m/V HR POLY VCR2 -- -7.29E-14 -- m²/V² HR POLY TCR1 -- -3.97E-4 -- $1/^{\circ}\text{C}$ HR POLY TCR2 -- 8.88E-7 -- $1/^{\circ}\text{C}^2$ 12.1 MIMCAP Electrical Parameters Rs_bot (Sheet resistance of bottom plate (W=2.8um) 2.0 4.5 7.0 Ohm/sq Rc_Via_bot (bottom plate Via Resistance, 0.2*0.2 um²) 3 5.2 7.4 Ohm/Via Rc_Via_top (top plate Via Resistance, 0.2*0.2 um²) 9 12 15 Ohm/Via 11.2 Non-salicide Resistances Note:The values of above sheet resistance were measured by WAT.	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.3	1	03/04/2010	3.4 Interconnect Thickness [bottom line] none 8.2.1 2.5V Operated at 3.3V NFET in P-sub Min. Typ. Max. Vtlin 0.575 0.646 0.711 Vtsat 0.532 0.603 0.666 Ion 510 571 634 Ioff -- 0.06 0.29 8.2.2 2.5V Operated at 3.3V PFET in N-well Min. Typ. Max. Vtlin -0.498 -0.574 -0.640 Vtsat -0.460 -0.536 -0.601 Ion -238.5 -264.6 -292.1 Ioff -- -11.1 -25.3 8.2.3 Gate Delay Min. Typ. Max. 44.4 47.2 50.7 9.2 3.3V PFET Electrical Parameters, in N-Well Min. Ion (W/L=10/0.37, @VD=VG=-3.3V) -22 10. Native NFET Electrical parameters 10.4 2.5VOD3.3V Thick Oxide Native NFET in P-Sub None 10. Native NFET Electrical parameters 10.6 1.2V Thin Oxide Native NFET in Deep NWell None	3.4 Interconnect Thickness [bottom line] If customer has static back-bias application, please contact UMC for HCI lifetime penalty discussion. 8.2.1 2.5V Operated at 3.3V NFET in P-sub Min. Typ. Max. Vtlin 0.578 0.649 0.712 Vtsat 0.525 0.595 0.658 Ion 482 540 599 Ioff -- 0.4 1 8.2.2 2.5V Operated at 3.3V PFET in N-well Min. Typ. Max. Vtlin -0.495 -0.572 -0.638 Vtsat -0.454 -0.530 -0.596 Ion -245 -272 -300 Ioff -- -22 -53.5 8.2.3 Gate Delay Min. Typ. Max. 45.0 47.8 51.2 9.2 3.3V PFET Electrical Parameters, in N-Well Min. Ion (W/L=10/0.37, @VD=VG=-3.3V) -225 10. Native NFET Electrical parameters 10.4 2.5VOD3.3V Thick Oxide Native NFET in P-Sub Min. Typ. Max. Vtlin (W/L=10/1.4, @ID=300nA*W/L, VD=0.05V) -0.048 -0.153 -0.257 V Vtsat (W/L=10/1.4, @ID=300nA*W/L, VD=3.3V) -0.126 -0.228 -0.329 V Ion (W/L=10/1.4, @VD=VG=3.3V) 441.6 533.4 622.6 uA/um 10. Native NFET Electrical parameters 10.6 1.2V Thin Oxide Native NFET in Deep NWell Min. Typ. Max. Vtlin (W/L=1/0.2, @ID=300nA*W/L, VD=0.05V) 0.073 0.148 0.222 V Vtsat (W/L=1/0.2, @ID=300nA*W/L, VD=1.2V) 0.028 0.101 0.172 V Ion (W/L=1/0.2, @VD=VG=1.2V) 491 615 737 uA/um	Add wording for remind Data update

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.3	1	03/04/2010	10. Native NFET Electrical parameters 10.7 1.8V Thick Oxide Native NFET in Deep NWell None 10. Native NFET Electrical parameters 10.8 2.5V Thick Oxide Native NFET in Deep NWell None 10. Native NFET Electrical parameters 10.9 2.5VOD3.3V Thick Oxide Native NFET in Deep NWell None 10. Native NFET Electrical parameters 10.10 3.3V Thick Oxide Native NFET in Deep NWell None 11.1.2 Temperature Coefficient of Resistors 11.1.2.2 Option: 1P10M (1x,4x,6x Metal) Metal7 sheet resistance 3.5E-03 1°C Metal8 sheet resistance 3.5E-03 1°C	10. Native NFET Electrical parameters 10.7 1.8V Thick Oxide Native NFET in Deep NWell Min. Typ. Max. Vtlin (W/L=10/1, @ID=300nA*W/L,VD=0.05V) -0.074 -0.010 0.053 V Vtsat (W/L=10/1, @ID=300nA*W/L,VD=1.8V) -0.090 -0.027 0.035 V Ion (W/L=10/1, @VD=VG=1.8V) 314 367 420 uA/um 10. Native NFET Electrical parameters 10.8 2.5V Thick Oxide Native NFET in Deep NWell Min. Typ. Max. Vtlin (W/L=10/1.2, @ID=300nA*W/L,VD=0.05V) -0.049 0.044 0.137 V Vtsat (W/L=10/1.2, @ID=300nA*W/L,VD=2.5V) -0.066 0.026 0.118 V Ion (W/L=10/1.2, @VD=VG=2.5V) 299 359 419 uA/um 10. Native NFET Electrical parameters 10.9 2.5VOD3.3V Thick Oxide Native NFET in Deep NWell Min. Typ. Max. Vtlin (W/L=10/1.2, @ID=300nA*W/L,VD=0.05V) -0.049 0.044 0.136 V Vtsat (W/L=10/1.2, @ID=300nA*W/L,VD=3.3V) -0.070 0.022 0.113 V Ion (W/L=10/1.2, @VD=VG=3.3V) 423 503 578 uA/um 10. Native NFET Electrical parameters 10.10 3.3V Thick Oxide Native NFET in Deep NWell Min. Typ. Max. Vtlin (W/L=10/1.2, @ID=300nA*W/L,VD=0.05V) -0.016 0.090 0.199 V Vtsat (W/L=10/1.2, @ID=300nA*W/L,VD=3.3V) -0.036 0.068 0.174 V Ion (W/L=10/1.2, @VD=VG=3.3V) 350 436 527 uA/um 11.1.2 Temperature Coefficient of Resistors 11.1.2.2 Option: 1P10M (1x,2x,6x Metal) Metal7 sheet resistance 3.2E-03 1°C Metal8 sheet resistance 3.2E-03 1°C	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.4	1	11/04/2010	3. Process Parameters: Note A.~B. None 3.1 Starting Material Epi wafer Unit Ohm-cm 3.2 Inter-layer Dielectric Thickness 3.2.1 FEOL Layers All Electrical *picture as attached All thickness Units in Å All thickness Units in kÅ 3.4.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) Metal10 (for 32.5kÅ thickness) AL-RDL(L2) None None 3.4.2.2 Option 1: 1P10M (1x,2x, 6x Metal) AL-RDL(L2) None None 3.4.2 BEOL layers If customer has static back-bias application, please contact UMC for HCI lifetime penalty discussion. 4.1 1.2V NFET Electrical Parameters, in P-Sub Tox_inv*1 Tox_gl*2 (@VG=-2V, VB=0V) Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) 2. Tox_gl = -2.25*(log(J)-7.101), where J (A/cm2) is the gate oxide leakage current. None	3. Process Parameters: Note*1~Note*2 Note*3 For Section4-10, if customer has static back-bias application, please contact UMC for HCI lifetime penalty discussion. 3.1Starting Material Epi wafer Unit Ohm*cm 3.2Inter-layer Dielectric Thickness 3.2.1 FEOL Layers All Electrical (*4) Note*4 » $Tox = \epsilon_0 * \epsilon_{ox} * AREA / Cox$, $\epsilon = 3.9$ All thickness Units in Å All thickness Units in kÅ 3.4.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) Metal10 (for 32.5kÅ thickness) AL-RDL(L2) (for 12kÅ thickness) AL-RDL(L2) (for 25kÅ thickness) AL-RDL(L2) (for 36kÅ thickness) 3.4.2.2 Option 1: 1P10M (1x,2x, 6x Metal) AL-RDL(L2) (for 12kÅ thickness) AL-RDL(L2) (for 25kÅ thickness) AL-RDL(L2) (for 36kÅ thickness) 3.4.2 BEOL layers None 4.1 1.2V NFET Electrical Parameters, in P-Sub Tox_inv Tox_gl (@VG=-2V, VB=0V) (*5) Vtlin (W/L=1/0.06, @ID=300nA*W/L, VD=0.05V) (*6) Note*5 Tox_gl = -2.25*(log(J)-7.101), where J (A/cm2) is the gate oxide leakage current. Note*6 The threshold voltage is defined as gate to source bias at which $ID = 300nA*W/L$ for NFET and $ID = 70nA*W/L$ for PFET, where $L = L_{TEM}$.	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.4	1	11/04/2010	3. Except separately specified, the electrical parameters are given for T= 25°C. 4.3 Gate Delay 1. Tox_inv is defined as the equation of $* T_{ox} = \epsilon_0 * \epsilon_{ox} * AREA / C_{ox}, \epsilon_{ox} = 3.9$ Sections 4~10 All Tox_inv and Tox_phy thickness Units in Å All Gate Delay Units in psec/stage 11.1.1.1 FEOL Layer N+ sheet resistance between two Poly lines (S= 0.13 um) P+ sheet resistance between two Poly lines (S= 0.13 um) 11.1.1.2 BEOL Layer 11.1.1.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) Metal10 (32.5kÅ thickness)sheet resistance (W= 2um) AL_RDL(L2) sheet resistance (W= 3 um) None None Mvia9 (32.5kÅ metal) resistance (0.6*0.6 um2) TMV_RDL(L1) AL-Via resistance (4.0*4.0 um2) 0.02 0.05 0.1 Ohm/mvia None	Note*7 Except separately specified, the electrical parameters are given for T= 25°C. 4.3Gate Delay None Sections 4~10 All Tox_inv and Tox_phy thickness Units in Å All Gate Delay Units in pSec/stage 11.1.1.1 FEOL Layers N+ sheet resistance between two Poly lines (S= 0.13 um) P+ sheet resistance between two Poly lines (S= 0.13 um) 11.1.1.2 BEOL Layers 11.1.1.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) Metal10 sheet resistance (32.5kÅ thickness) (W= 2um) AL_RDL(L2) sheet resistance (12kÅ thickness) (W= 2.7 um) AL_RDL(L2) sheet resistance (25kÅ thickness) (W= 2.7 um) 9.2 11.5 13.8 mOhm/sq AL_RDL(L2) sheet resistance (36kÅ thickness) (W= 2.7 um) 6.24 7.8 9.36 mOhm/sq Mvia9 (32.5kÅ metal) resistance (0.6*0.6 um2) TMV_RDL(L1) AL-Via resistance (4.0*4.0 um2 , for 12kÅ AL_RDL) 0.005 0.013 0.026 Ohm/mvia TMV_RDL(L1) AL-Via resistance (4.0*4.0 um2 , for 25kÅ and 36kÅ AL_RDL) 0.004 0.011 0.022 Ohm/mvia	

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1.4	1	11/04/2010	None	TMV_RDL(L1) AL-Via resistance (3.0*3.0 um2 , for 12kA AL_RDL) 0.013 0.033 0.066 Ohm/mvia	
			None	TMV_RDL(L1) AL-Via resistance (3.0*3.0 um2 , for 25kA and 36kA AL_RDL) 0.009 0.022 0.044 Ohm/mvia	
			11.1.1.2.2 Option: 1P10M (1x,2x,6x Metal)	11.1.1.2.2 Option: 1P10M (1x,2x,6x Metal)	
			None	AL_RDL(L2) sheet resistance (12kA thickness) (W= 2.7 um) 13 22 36 mOhm/sq	
			None	AL_RDL(L2) sheet resistance (25kA thickness) (W= 2.7 um) 9.2 11.5 13.8 mOhm/sq	
			None	AL_RDL(L2) sheet resistance (36kA thickness) (W= 2.7 um) 6.24 7.8 9.36 mOhm/sq	
			TMV_RDL(L1) AL-Via resistance (4.0*4.0 um2) 0.02 0.05 0.1 Ohm/mvia	TMV_RDL(L1) AL-Via resistance (4.0*4.0 um2 , for 25kA and 36kA AL_RDL) 0.004 0.011 0.022 Ohm/mvia	
			None	TMV_RDL(L1) AL-Via resistance (3.0*3.0 um2 , for 12kA AL_RDL) 0.013 0.033 0.066 Ohm/mvia	
			None	TMV_RDL(L1) AL-Via resistance (3.0*3.0 um2 , for 25kA and 36kA AL_RDL) 0.009 0.022 0.044 Ohm/mvia	
			11.1.2.1 FEOL Layers	11.1.2.1 TCR of FEOL Layers	
			TCR Unit	Min. Typ. Max. Unit	
			N+ Diffusion sheet resistance 1.7E-3 1/°C	N+ Diffusion sheet resistance 1.7E-3 -- 1/°C	--
				(format change continued to following)	
			N+Poly sheet resistance	N+ Poly sheet resistance	
			P+Poly sheet resistance	P+ Poly sheet resistance	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.4	1	11/04/2010	11.1.2.2 BEOL layers 11.1.2.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) AL_RDL(L2) sheet resistance None None 11.1.2.2.2 Option: 1P10M (1x,2x,6x Metal) AL_RDL(L2) sheet resistance None None 11.3.3 Non Salicide HR POLY Resistor Ohm · um 12.1 MIMCAP Electrical Parameters Rs_bot (Sheet resistance of bottom plate Rs_top (Sheet resistance of top metal plate	11.1.2.2 TCR of BEOL Layers 11.1.2.2.1 UMC platform offering: 1P10M (1x,2x,4x Metal) AL_RDL(L2) sheet resistance (12kÅ thickness) AL_RDL(L2) sheet resistance (25kÅ thickness) -- 1/°C 3.5E-03 -- AL_RDL(L2) sheet resistance (36kÅ thickness) -- 1/°C 3.5E-03 -- 11.1.2.2.2 Option: 1P10M (1x,2x,6x Metal) AL_RDL(L2) sheet resistance (12kÅ thickness) AL_RDL(L2) sheet resistance (25kÅ thickness) -- 1/°C 3.5E-03 -- AL_RDL(L2) sheet resistance (36kÅ thickness) -- 1/°C 3.5E-03 -- 11.3.3 Non Salicide HR POLY Resistor Ohm*um 12.1 MIMCAP Electrical Parameters Rs_bot (Sheet resistance of bottom plate) Rs_top (Sheet resistance of top metal plate)	

Ver.	Phase	Approved Date	From	To	Remark (Purpose)
1.5	1	02/22/2013	5.2 & 6.2 1.2V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Tox_inv (@100kHz, VG=-1.2V, VB=0V) 26.5 27.5 28.5 Å	5.2 & 6.2 1.2V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Tox_inv (@100kHz, VG=-1.2V, VB=0V) 27 28 29	Aligned to SPICE
			7.2 1.8V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Tox_inv (@100kHz, VG=-1.8V, VB=0V) 37.8 40.8 43.8 Å	7.2 1.8V PFET Electrical Parameters, in N-Well Min. Typ. Max. Unit Tox_inv (@100kHz, VG=-1.8V, VB=0V) 37.5 40.5 43.5 Å	Aligned to SPICE
1.6	1	03/25/2013	5.2 & 6.2 Tox_inv 27 28 29	5.2 & 6.2 Tox_inv 26.5 27.5 28.5	Previous mistake

* END *