



AMI Semiconductor I2T100 technology

The Intelligent Interface Technology (I2T100) is the high voltage extension of the AMIS CMOS 0.7 μm mixed signal technology. I2T100 is an answer to the ever increasing demand for more digital integration in mixed analog/digital ASIC 's and more programmability/flexibility.

It is derived from the fully digital 0.7 μ CMOS process and extended with the following analog capabilities:

- Precision highly linear thin oxide poly/diffused capacitors
- Precision high ohmic polysilicon resistors
- Low Vt PMOS transistor
- Medium-High voltage NDMOS
- Floating medium-high voltage NDMOS and PDMOS
- Floating NMOS, PMOS
- Floating Low Voltage CMOS blocks for digital logic
- Low-medium-high voltage bipolar transistors
- Zener zap diode for OTP
- High-Medium voltage floating capacitors
- Deep n+ doped guard rings

For optimised medium-high voltage devices, a dual poly gate stack is used, respectively for Low Voltage and High Voltage components.

Europractice distributes the design kit from AMIS, using the Synopsis & Cadence environment based on the Spectre simulator (Analog Artist) for mixed mode front-end simulation and Silicon Ensemble place&route for CMOS 0.7 back-end. Checks can be performed using the Dracula decks.

A full set of documentation and design kit is available after the appropriate DKLA is signed.

Key process technology specifications

Technology	0.7 μm , refer to the AMI Semiconductor C07M-A technology specification sheet
Technology	I2t100
Core voltage CMOS 0.7	5.0 V
I/O voltages CMOS 0.7	5.0V
Poly / Metal layer	1/2M (optional max. 3 metals for dedicated runs)
Substrate / well formation	P-sub, twin-well
Isolation	LOCOS
Gate oxide thickness (n+ doped)	17.0nm
Gate oxide thickness (for MV-HV devices)	42.0nm
ILD Planarization	BPSG
IMD Planarization	PECVD/SOG
Interconnect	Aluminium alloy based, low interconnect resistivity
Low Vt	Low VT PMOS transistors
Passivation	Nitride based
Capacitors	Precision high linear thin oxide poly/diffusion capacitors
Resistors	Precision high Ohmic polysilicon resistors

Poly diode	A diode without substrate current
Poly pitch	1.5 μ m
Metal pitch	1.8 μ m for metal 1 2.2 μ m for metal 2
Interconnect thickness	0.42 μ m for Poly 0.8 μ m for metal1 1.0 μ m for metal2

Key electrical parameters

Parameter @ 25°C		Typ. Value	Unit
NMOS	VTON (20/0.7, linear extrapolated)	0.74	V
	Vmax=Vbd	5.5	V
	IDS (20/0.7, VD=VG=5V)	358	μ A/ μ m
	Body factor (20/0.7, VD=0.1V, Vbulk= 0 \rightarrow 6.0V)	0.6	V ^{1/2}

Parameter @ 25°C		Typ. Value	Unit
PMOS	VTON (20/0.7, linear extrapolated)	-0.95	V
	Vmax=Vbd	5.5	V
	IDS (20/0.7, VD=VG=5V)	-176	μ A/ μ m
	Body factor (20/0.7, VD=0.1V, Vbulk= 0 \rightarrow 6.0V)	0.42	V ^{1/2}

Parameter @ 25°C		Typ. Value	Unit
Low Vt PMOS	VTON (20/1.2, linear extrapolated)	-0.78	V
	Vmax=Vbd	5.5	V
	IDS (20/1.2, VD=VG=5V)	-121	μ A/ μ m
	Body factor (20/1.2, VD=0.1V, Vbulk= 0 \rightarrow 6.0V)	0.5	V ^{1/2}

Parameter @ 25°C		Typ. Value	Unit
Floating NMOS	VTON (20/0.7, linear extrapolated)	0.74	V
	Vmax=Vfloat to Psubtrate	100	V
	Vgsmax, Vdbmax	5.5	V
	IDS (20/0.7, VD=VG=5V)	358	μ A/ μ m
	Body factor (20/0.7, VD=0.1V, Vbulk= 0 \rightarrow 6.0V)	0.6	V ^{1/2}

Parameter, floating @ 100V		Typ. Value	Unit
Floating PMOS	VTOP (25/0.7, linear extrapolated)	-1.1	V
	Vmax= Vfloat to Psubtrate	100	V
	Vgsmax, Vdbmax	-5.5	V
	IDS (25/0.7, VD=VG=-5.0V)	-160	μ A/ μ m
	Body factor (25/0.7, VD=-0.1V, Vbulk=0 \rightarrow -6.0V)	0.425	V ^{1/2}

Technology specification sheet

Parameter @ 25°C		Typ. Value	Unit
NDMOS for 100V	VTON (40/4)	1.0	V
	Vmax=Vbd	100	V
	Vgsmax (full lifetime)	12	V
	Ids (40/4, Vds=40, Vgs=4.0V)	1210	μA
	Ron * Area (Vds = 100V)	1.5	Ω*mm2
Parameter @ 25°C		Typ. Value	Unit
NDMOS for 30V (Thin Ox)	VTON (40/4)	0.67	V
	Vmax=Vbd	30	V
	Vgsmax (full lifetime)	5.5	V
	Ids (40/4, Vds=20, Vgs=5.0V)	4675	μA
	Ron * Area (Vds=30V)	0.37	Ω*mm2
Parameter @ 25°C		Typ. Value	Unit
NDMOS for 30V (Thick Ox)	VTON (40/4)	1.03	V
	Vmax=Vbd	30	V
	Vgsmax (full lifetime)	12	V
	Ids (40/4, Vds=15, Vgs=4.0V)	1450	μA
	Ron * Area (Vds=30V)	0.26	Ω*mm2
Parameter, floating @ 100V		Typ. Value	Unit
Selfaligned NDMOS floating for 100V	VTON (40 μm)	2.4	V
	Vmax=Vbd	95	V
	Vgsmax (full lifetime)	12	V
	Ids (40 μm, Vds=40, Vgs=5.0V)	2050	μA
	Ron * Area (Vds=100V)	0.5	Ω*mm2
Parameter, floating @ 60V		Typ. Value	Unit
Selfaligned NDMOS floating for 60V	VTON (40 μm)	2.4	V
	Vmax=Vbd	60	V
	Vgsmax (full lifetime)	12	V
	Ids (40 μm, Vds=40, Vgs=5.0V)	2250	μA
	Ron * Area (Vds=55V)	0.16	Ω*mm2
Parameter, floating @ 40V		Typ. Value	Unit
Selfaligned NDMOS floating for 40V	VTON (40 μm)	2.4	V
	Vmax=Vbd	40	V
	Vgsmax (full lifetime)	12	V
	Ids (40 μm, Vds=25, Vgs=5.0V)	2200	μA
	Ron * Area (Vds=40V)	0.09	Ω*mm2
Parameter @ 25°C		Typ. Value	Unit
PDMOS for 90V	VTOP (40/4)	-1.1	V
	Vmax=Vbd	-90	V
	Vgsmax (full lifetime)	12	V
	Ids (40/3, Vds=-40, Vgs=-4.0V)	980	μA
	Ron * Area	1	Ω*mm2

Parameter @ 25°C		Typ. Value	Unit
PDMOS for 75V	VTOP (40/3.4)	-1.1	V
	Vmax=Vbd	-75	V
	Vgsmax (full lifetime)	12	V
	Ids (40/3.4, Vds=40, Vgs=4.0V)	1125	μA
	Ron * Area (Vds=-75V)	0.58	Ω*mm2
Parameter @ 25°C		Typ. Value	Unit
PDMOS for 40V	VTOP (40/3.2)	-1.13	V
	Vmax=Vbd	-40	V
	Vgsmax (full lifetime)	12	V
	Ids (40/3.2, Vds=40, Vgs=4.0V)	1175	μA
	Ron * Area (Vds=-40V)	0.38	Ω*mm2
Parameter @ 25°C		Typ. Value	Unit
Depleted PDMOS for 100V	Vmax=Vbd	-100	V
	Vgsmax (full lifetime)	5.5	V
	Ids (40/3, Vds=-40, Vgs=0V)	180	μA

Parameter, Ae=5 μm2, area=1352 μm2		Typ. Value	Unit
NPN floating at 60V	Hfe	58	-
	Bvceo @ Ie=1μA	25	V
	Bvces min	60	V
	I _{max}	0.96	mA
Parameter, basic element: Ae=19 μm2, area=3081 μm2		Typ. Value	Unit
NPN floating at 60V	Hfe	45	-
	Bvceo @ Ie=1μA	25	V
	Bvces min	25	V
	I _{max}	1.2	mA
Parameter, basic element: Ae=5 μm2, area=3529 μm2		Typ. Value	Unit
NPN floating at 100V	Hfe	60	-
	Bvceo @ Ie=1μA	25	V
	Bvces min	60	V
	I _{max}	0.3	mA
Parameter, Ae=49 μm2, area=4490 μm2		Typ. Value	Unit
NPN floating at 100V	Hfe	40	-
	Bvceo @ Ie=1μA	25	V
	Bvces min	60	V
	I _{max}	2.7	mA
Parameter, Ae=2390 μm2, area=33372 μm2		Typ. Value	Unit
NPN floating at 100V	Hfe	34	-
	Bvceo @ Ie=1μA	25	V
	Bvces min	60	V
	I _{max}	81	mA

Technology specification sheet

Parameter, area=2289 μm^2		Typ. Value	Unit
Substrate PNP	Hfe	22	-
	Bvceo @ Ie=1 μA	30	V
	I _{max}	0.3	mA
Parameter, area=1542 μm^2		Typ. Value	Unit
PNP floating at 100 V	Hfe	700	-
	Bvceo @ Ie=1 μA	5.5	V
	Bvces min	5.5	V
	I _{max}	0.3	mA
Parameter, area=5139 μm^2		Typ. Value	Unit
PNP	Hfe	800	-
	Bvceo @ Ie=1 μA	25	V
	Bvces min	40	V
	I _{max}	0.3	mA
Parameter, area=98354 μm^2		Typ. Value	Unit
PNP	Hfe	880	-
	Bvceo @ Ie=1 μA	25	V
	Bvces min	80	V
	I _{max}	0.3	mA

Parameter, W=2.2 μm		Typ. Value	Unit
POLY diode	BV	6.76	V
	V _{forward} @ I=500 μA	~1.7	V
	I _{max} (2.2 μm)	~130	$\mu\text{A}/\mu\text{m}$
	I _{leak} (2.2 μm) @ -5V	~1.4	nA
Parameter, area=6432 μm^2		Typ. Value	Unit
HV diode floating @ 100V	BV	100	V
	R _{diff} (I _a =2mA)	< 5	k Ω
	I _{sub} /I _a (I _a =10mA)	< 1	%

Parameter @25 °C		Typ. Value	Unit
Poly/Thin Gate Ox/Nwell capacitor	C _{plate}	0.8	fF/ μm^2
	V _{bd_max} (full life time)	12	V
Poly/Poly (Medium voltage)	C _{plate}	0.36	fF/ μm^2
	V _{bd_max} (full life time)	30	V
Metal1/Poly/Metal2 (high voltage capacitor)	C _{plate}	0.097	fF/ μm^2
	V _{bd_max} (full life time)	100	V

Parameter @25 °C		Typ. Value	Unit
P _{body} Diffusion in N _{tub}	R _{sheet}	1250	Ω/square
N ₊ Diffusion in P-well	R _{sheet}	67.5	Ω/square
P ₊ Diffusion in N-well	R _{sheet}	96	Ω/square

Performance

AMIS_I2T100_v8

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Speed@5.0V: ring oscillator delay: 170ps/stage

Leakage	25C	
NMOS (W/L=20/0.7, Vds=7V, Vgs=0V)	< 10	pA/ μ m
PMOS (W/L=20/0.7, Vds=-7V, Vgs=0V)	< 10	pA/ μ m