

Process C1230

BiCMOS 1.2 μ m

Low TCR P-Poly for Analog

Electrical Characteristics

T=25°C Unless otherwise noted

N-Channel Transistor	Symbol	Minimum	Typical	Maximum	Unit	Comments
Threshold Voltage	V_{TN}	0.55	0.75	0.95	V	100x1.2 μ m
Body Factor	γ_N		0.34		$V^{1/2}$	100x1.2 μ m
Conduction Factor	β_N	64	75	86	$\mu A/V^2$	100x100 μ m
Effective Channel Length	L_{effN}	0.8	1.0	1.2	μ m	100x1.2 μ m
Width Encroachment	ΔW_N		0.6		μ m	Per side
Punch Through Voltage	$BVDSS_N$	9			V	
Poly Field Threshold Voltage	$VTF_{P(N)}$	10			V	

P-Channel Transistor	Symbol	Minimum	Typical	Maximum	Unit	Comments
Threshold Voltage	V_{TP}	-0.7	-0.9	-1.1	V	100x1.2 μ m
Body Factor	γ_P		0.38		$V^{1/2}$	100x1.2 μ m
Conduction Factor	β_P	21	25	29	$\mu A/V^2$	100x100 μ m
Effective Channel Length	L_{effP}	0.9	1.1	1.3	μ m	100x1.2 μ m
Width Encroachment	ΔW_P		0.8		μ m	Per side
Punch Through Voltage	$BVDSS_P$	-9			V	
Poly Field Threshold Voltage	$VTF_{P(P)}$	-10			V	

Diffusion & Thin Films	Symbol	Minimum	Typical	Maximum	Unit	Comments
Base Resistor Sheet Resist.	ρ_{RB}	1.33	1.66	2.00	$K\Omega/\square$	
Base Resistor Effective Width Change	ΔW_{RB}	-0.2	-0.6	-1.0	μ m	
Base Resistor Voltage Coefficient, Narrow Size	V_{OLTCO_N}		11297		ppm/V	250x5 μ m
Base Resistor Voltage Coefficient, Wide Size	V_{OLTCO_W}		15468		ppm/V	250x25 μ m
Base Resistor Voltage Coefficient, Narrow Size	T_{EMPCO_N}		2761		ppm/C	250x5 μ m
Low TCR P-Poly Resistor	$\rho_{HI-POLY}$	1.5	2.36	2.5	$K\Omega/\square$	
Temperature Coefficient - Low TCR Poly	TCR Poly	-100	0	+50	ppm/C	
Base to Emitter Capacitance	C_{BEO}		33.8		fF/ μ m ²	
Base to Collector Cap.	C_{BCO}		56.9		fF/ μ m ²	
Base to Substrate Cap.	C_{CS}		35.1		fF/ μ m ²	
Collector to Substrate Junction Capacitance	C_{JS}		0.1		fF/ μ m ²	

Capacitance	Symbol	Minimum	Typical	Maximum	Unit	Comments
Gate Oxide	C_{OX}	1.28	1.38	1.58	fF/ μ m ²	
Metal-1 to Poly-1	C_{M1P}		0.057		fF/ μ m ²	
Metal-1 to Silicon	C_{M1S}		0.028		fF/ μ m ²	
Metal-2 to Metal-1	C_{MM}		0.035		fF/ μ m ²	
Poly-1 to Poly-2	C_{P1P2}	0.69	0.86	1.03	fF/ μ m ²	

Electrical Characteristics**NPN Bipolar Transistor Characteristics (Emitter size 4.5 x 4.5 μ m)**

	Sym	Min	Typ	Max	Unit	Comments
Current Gain	h_{FE}		118			@100 μ A
Early Voltage	V_A		22		V	
Cut - Off Frequency	f_t		6.2		GHz	
Collector-Emitter Saturation Voltage	V_{CESAT}		0.3		V	
Collector to Emitter Breakdown Voltage	BV_{CEO}		6.5		V	
Collector to Base Breakdown Voltage	BV_{CBO}		17		V	
Emitter to Base Breakdown Voltage	BV_{EBO}		6		V	
Emitter Resistance	R_E		40		Ω	
Base Spreading Resistance	R_B		1000		Ω	
Collector Saturation Resistance	R_C		100		Ω	
Base to Emitter Capacitance	C_{BEO}				pF	
Base to Collector Capacitance	C_{BCO}				pF	
Base to Substrate Capacitance	C_{CS}				pF	

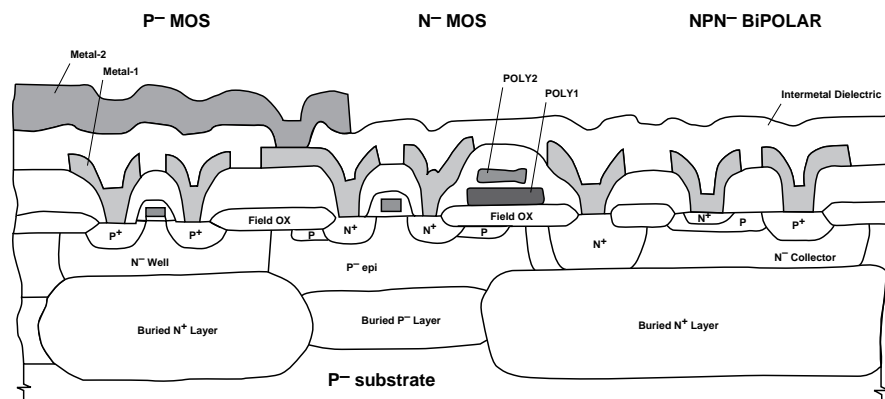
NPN Bipolar Transistor Characteristics (Emitter size 31.5 x 4.5 μ m)

	Sym	Min	Typ	Max	Unit	Comments
Current Gain	h_{FE}		110			@100 μ A
Early Voltage	V_A		22		V	
Cut - Off Frequency	f_t		6.4		GHz	
Collector-Emitter Saturation Voltage	V_{CESAT}		0.2		V	
Collector to Emitter Breakdown Voltage	BV_{CEO}		6.5		V	
Collector to Base Breakdown Voltage	BV_{CBO}		17		V	
Emitter to Base Breakdown Voltage	BV_{EBO}		6		V	
Emitter Resistance	R_E		6		Ω	
Base Spreading Resistance	R_B		250		Ω	
Collector Saturation Resistance	R_C		15		Ω	

Physical Characteristics

Starting Material	p <100>	N+/P+ Width/Space	2.5/1.2 μ m
Starting Mat. Resistivity	25 - 50 Ω -cm	N+ to P+ Space	9.0 μ m
Typ. Operating Voltage	5V	Contact to Poly Space	1.5 μ m
Well Type	N-well	Contact Overlap of Diffusion	1.0 μ m
Metal Layers	2	Contact Overlap of Poly	1.0 μ m
Poly Layers	2	Metal-1 Overlap of Contact	1.0 μ m
Contact Size	1.5x1.5 μ m	Metal-1 Overlap of Via	1.0 μ m
Via Size	1.5x1.5 μ m	Metal-2 Overlap of Via	1.0 μ m
Metal-1 Width/Space	2.5 / 1.5 μ m	Minimum Pad Opening	65x65 μ m
Metal-2 Width/space	2.5 / 1.5 μ m	Minimum Pad-to-Pad Spacing	5.0 μ m
Gate Poly Width/Space	1.5 / 2.0 μ m	Minimum Pad Pitch	80.0 μ m

Special feature of C1206 Process: BiCMOS 1.2- μ m technology with a cutoff frequency of 6.4GHz.



Cross-sectional view of the BiCMOS 1.2 C1230 process

