

High Linearity InGaP HBT Power Process



- High Linearity InGaP HBT (P1&P2) processes have been developed specifically for battery-powered high linearity power amplifier applications
- P2 can also be operated at 5V bias for high-linearity base station gain blocks
- High Linearity Power Amplifiers with superior performance and reliability have been demonstrated by customers for Infrastructure gain blocks, CDMA/WCDMA, WiFi and WiMAX
- Processes have been in mass production since 2001

Example of CDMA PA Performance



($T_C=+25^\circ\text{C}$, $V_{CC}=+3.4\text{ V}$, $V_{REF}=+2.85\text{ V}$, V_{MODE} as specified, $50\ \Omega$ system)

Parameter	Specification				Condition
	Min.	Typ.	Max.	Unit	
Gain	28 25	30 27	- -	dB	$P_{OUT}= +28\text{ dBm}$, $V_{mode}=0\text{V}$ $P_{OUT}= +16\text{ dBm}$, $V_{mode}=+2.85\text{V}$
Gain Variation	-	± 0.2	-	dB	
Total Supply Current I_{T_HIGH} I_{T_LOW}	- -	470 125	500	mA mA	$P_{OUT}= +28\text{dBm}$, $V_{mode}=0\text{V}$ $P_{OUT}= +16\text{dBm}$, $V_{mode}=0\text{V}$
Adjacent Channel Power at $\pm 885\text{ kHz}$ offset; Primary Channel BW=1.23 MHz Adjacent Channel BW= 30 kHz	- -	-48 -52	-45 -45	dBc dBc	$P_{OUT}= +28\text{ dBm}$, $V_{mode}=0\text{V}$ $P_{OUT}= +16\text{ dBm}$, $V_{mode}=+2.85\text{V}$ CDMA2000 Modulation
Adjacent Channel Power at $\pm 1.98\text{ MHz}$ offset; Primary Channel BW=1.23 MHz Adjacent Channel BW= 30 kHz	- -	- -65	-55 -60	dBc dBc	$P_{OUT}= +28\text{ dBm}$, $V_{mode}=0\text{V}$ $P_{OUT}= +16\text{ dBm}$, $V_{mode}=+2.85\text{V}$ CDMA2000 Modulation
Power-Added Efficiency	35 8	40 9	- -	% %	$P_{OUT}= +28\text{ dBm}$, $V_{mode}=0\text{V}$ $P_{OUT}= +16\text{ dBm}$, $V_{mode}=+2.85\text{V}$
Quiescent Current (I_{cq})	- -	60 40	75 50	mA mA	High Power mode, $V_{mode}=0\text{V}$ Low Power mode, $V_{mode}=+2.85\text{V}$
Reference Current	-	1.5	-	mA	
Mode Control Current	-	1.3	-	mA	$V_{MODE}=+2.85\text{ V}$
Leakage Current	-	-	20	μA	$V_{CC}=+3.4\text{ V}$, $V_{REF}=0\text{ V}$, $V_{MODE}=0\text{ V}$
Harmonics 2fo 3fo	-40 -40	- -	- -	dBc dBc	
Input Impedance	-	-	2.0:1	VSWR	
Spurious Output Level (all spurious outputs)	-	-	-70	dBc	$P_{OUT} \leq +28\text{ dBm}$ In/Out-band load VSWR < 8:1
Noise Power in Rx Band 869-894 MHz		-138		dBm/Hz	$P_{OUT} \leq +28\text{ dBm}$
Load mismatch stress with no permanent degradation or failure	10:1	-	-	VSWR	$V_{CC}=+5\text{ V}$ $P_{IN}=+5\text{ dBm}$

CDMA2000 Modulation is configured as R-Pilot = -3.75dB, R-DCCH 9600 = 0dB, R-SCH1 9600 = 0dB; Peak-to-Average Ratio= 4.5dB @CCDF=1%

P2 InGaP HBT for WiMAX 802.16 PA



Performance:

Band Width =
3.3- 3.8 GHz

Bias = 5 V &
I_{cc}=600 mA

P_{1dB} =30 dBm

IP3 = 45 dBm

Applications:

- Wimax 802-16
- Fixed Wireless Access
- Wireless Local Loop



Parameter	Typical (25 deg. C)	
Frequency (GHz)	3.3	3.8
Gain (dB)	32	30
Gain Variation (dB/deg. C)	0.04	0.035
Input Return Loss (dB)	10	15
Output Return Loss (dB)	13	10
P_{1dB} (dBm)	30	30.5
Psat (dBm)	32	32
Output Third Order Intercept (dBm)	45	45
Noise Figure	5.8	6
Supply Current (mA)	615	615
Control Current (mA)	4	4
Switching Speed: ton, toff (nS)	20	20