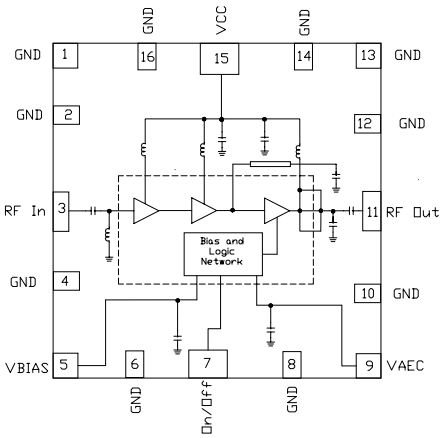
Advance

1900MHz CDMA Power Amplifier

Features

- IS-95/PCS operation in 1850-1910 MHz band
- 50Ω Matched Module
- +28.5dBm output power
- Passes industry standard VSWR ruggedness test.
- 32% Power Added Efficiency (PAE)
- Single power supply (no reference voltage required)
- On-chip logic-controlled power shutdown
- Small-outline, low profile, 6mm x 6mm, 16-lead LGA module

1900MHz CDMA Power Amplifier Block Diagram



Note: Package Base is ground

Description

The IBM3602017M016 CDMA Power Amplifier (PA) is a highly integrated module with a single band, three-stage device fabricated using IBM's Silicon Germanium (SiGe) BiCMOS technology for high efficiency in wireless handset applications. The power amplifier is optimized for Code Division Multiple Access (CDMA) operation in compliance with IS-95 standards

Advanced on-chip biasing technology enables optimum CDMA performance and eliminates the need for external reference voltages. An integrated power down function extends battery life. On-chip VSWR protection allows the 1900MHz CDMA PA to pass industry-standard ruggedness tests at full RF drive (+30dBm output) with load VSWR's exceeding 10:1 at V_{CC} = 5V.

The 1900MHz CDMA PA is available in a 16-lead, 6mm x 6mm, low profile module. The use of internal impedance matching within the module results in optimal operating characteristics with a small footprint.

Ordering Information

To order samples of the 1900MHz CDMA PA or a demonstration board, contact an IBM sales representative or distributor. Regional contact information is located on the IBM Microelectronics Division website at:

www.chips.ibm.com/support/howtobuy.html

Part Number	Description	Packaging
IBM3602017M016	1900MHz CDMA PA	6x6mm LGA
IBM2017EVBA	1900MHz CDMA PA Demonstration Board	PCB assembly

Note: The Power Amplifier is susceptible to damage from electrostatic discharge (ESD). Observe normal ESD precautions at all times when handling or using the device.

Electrical and Thermal Characteristics

Table 1. Absolute Minimum and Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units	Notes
Supply voltage	V_{CC}	2.9	5.0	Vdc	--
Standby current	--	--	2.0	µA	1
RF input power	--	--	+5	dBm	--
Collector-emitter breakdown (open)	BVceo	5.0	--	Vdc	--
PA on/off control	ON/OFF	-0.6	3.6	Vdc	--
Analog Efficiency Control	Vaec	--	4.0	Vdc	--
Operating temperature	--	-20	+85	°C	--
Storage temperature	--	-65	+150	°C	--

Notes:
1) VAEC set to 0V.

Table 2. RF Specifications, Standby Mode

Note: All measurements taken using the IBM2017EVBA Demonstration Board under IS-95 reverse link modulation with V_{CC} = 3.4Vdc; T_A = 25°C; ON/OFF input = logic '0', VAEC=0V

Parameter	Minimum	Typical	Maximum	Units
Frequency range	1850	1880	1910	MHz
Gain	--	--	-30	dB
Leakage current	--	--	2.0	µA

Table 3. RF Specifications, CDMA High Power Mode

Note: All measurements taken using the IBM2017EVBA Demonstration Board under IS-95 reverse link modulation with V_{CC} = 3.4Vdc; T_A = 25°C; ON/OFF input = logic '0'

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes
Analog efficiency control	Vaec	--	0.9	--	Vdc	1
Frequency range	--	1850	1880	1910	MHz	--
Gain	--	--	29	--	dB	--
Gain vs. temperature	--	-2	--	+2	dB	2
Noise figure	--	4.0	4.5	5.5	dB	--
Output power	--	--	+28.5	--	dBm	--
Quiescent current	Icq	--	85	95	mA	--
PAE	--	--	32	--	%	--
ACPR	--	-45	--	--	dBc	3
ACPR, temperature/voltage	--	--	-43	--	dBc	3
ALT1	--	--	-51	--	dBc	4
Stability	--	--	-60	--	dBc	5
Harmonics	--	--	-30	--	dBc	--
Input VSWR	--	--	--	2:1	--	--
Ruggedness VSWR	--	10:1	--	--	--	6

1. Icq = 85mA. Typical combined quiescent of stages 1, 2, and 3.
2. -20 to +85°C
3. ±1.25 MHz
4. ±1.98 MHz
5. Maximum spurs with out-of-band load VSWR < 5:1, in-band load VSWR < 3:1
6. No damage with P_{out}= +30dBm, V_{CC} = 5Vdc

Table 4. RF Specifications, CDMA Low Power Mode

Note: All measurements taken using the IBM2017EVBA Demonstration Board under IS-95 reverse link modulation (@ with V_{CC} = 3.4Vdc; T_A = 25°C; ON/OFF input = logic '0')

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes
Analog efficiency control	Vaec	--	1.6	--	Vdc	1
Frequency range	--	1850	1880	1910	MHz	
Gain	--	--	25	--	dB	
Gain vs. temperature	--	-2	--	+2	dB	2
Output power	--	--	+12	--	dBm	
Quiescent current	Icq	--	70	80	mA	
PAE	--	--	4	--	%	
ACPR	--	-46	--	--	dBc	3
ALT1	--	--	-58	--	dBc	4
Stability	--	--	-60	--	dBc	5
Harmonics	--	--	-30	--	dBc	
Input VSWR	--	--	--	2:1	--	
Ruggedness VSWR	--	10:1	--	--	--	6

1. Icq =70mA. Typical combined quiescent of stages 1, 2, and 3.
2. -20 to +85°C
3. ±1.25 MHz
4. ±1.98 MHz
5. Maximum spurs with out-of-band load VSWR < 5:1, in-band load VSWR < 3:1
6. No damage with P_{out} = +30dBm, V_{CC} = 5Vdc

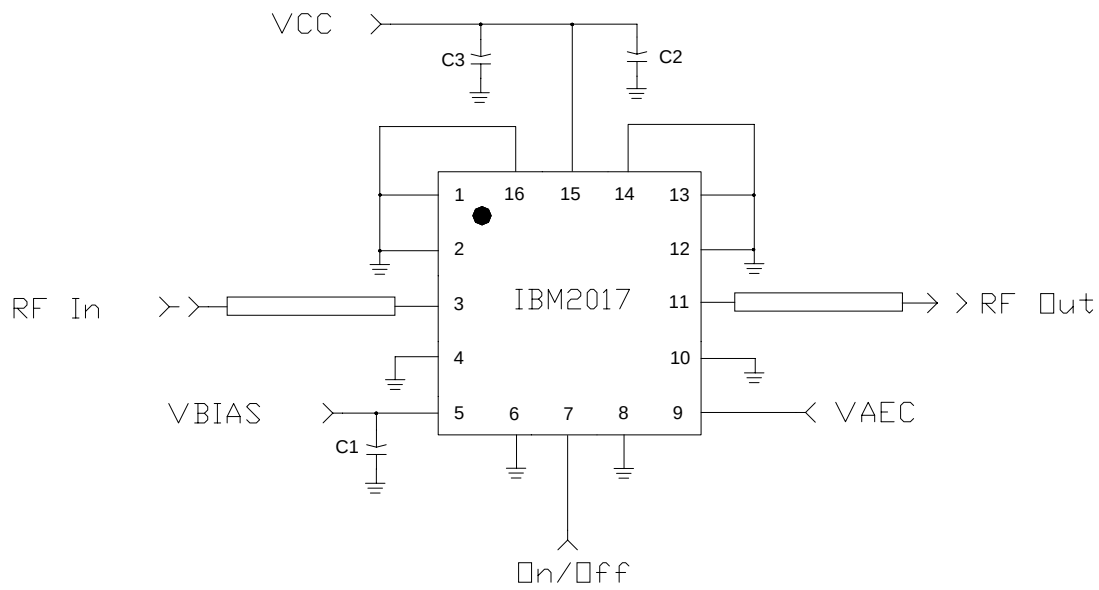
Table 5. Lead Description

Lead	Name	Type	Description
1	GND	--	Ground
2	GND	--	Ground
3	RF_IN	Input	RF Input
4	GND	--	Ground
5	VBIAS	Input	Bias and Logic Network Bias
6	GND	--	Ground
7	ON / OFF	Input	Power Amplifier ON / OFF Control
8	GND	--	Ground
9	VAEC	Input	Gain control
10	GND	--	Ground
11	RF_OUT	Output	RF Output
12	GND	--	Ground
13	GND	--	Ground
14	GND	--	Ground
15	VCC	Input	Collector Bias, Stages 1,2,3
16	GND	--	Ground

Table 6. Logic Input Voltage Levels

Level	Minimum	Maximum	Units
Logic 0	0	0.6	Vdc
Logic 1	2	V_{CC}	Vdc

Figure 1. Demonstration Board Schematic



Functional Description

Figure 1 shows the 1900MHz CDMA PA module as configured with the IBM2017EVBA Power Amplifier Demonstration Board. Pins VCC and VBIAS supply DC power to the PA. A nominal voltage of 3.4Vdc biases the PA and the Bias and Logic Network. The only other components required are de-coupling capacitors C1, C2 and C3.

The Demonstration Board contains the fully integrated IBM3602017M016 1900MHz CDMA PA module which provides all required power amplifier matching. No other components are required.

A positive voltage applied to the analog efficiency control pin, “VAEC”, sets the PA’s quiescent current and determines ACPR vs. output power. Applying a logic '1' level (2-3.6V) to the ON/OFF pin places the PA into a power down state that draws less than 2µA of current.VAEC should be set to 0V during “OFF” mode.

Figure 2. Module Package Dimensions

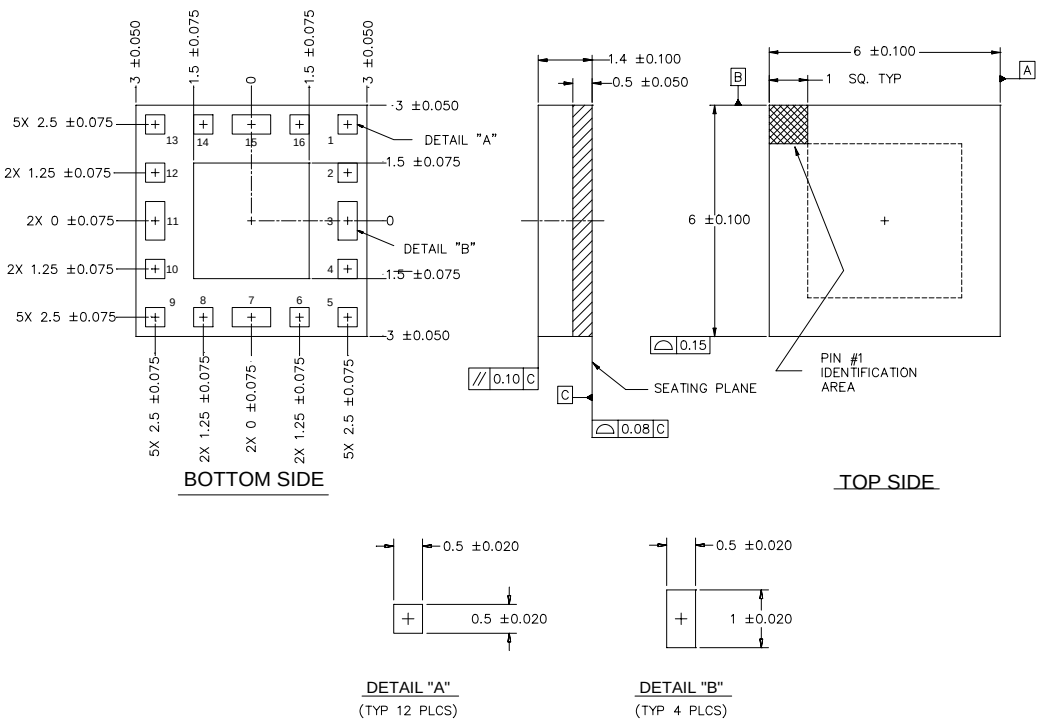
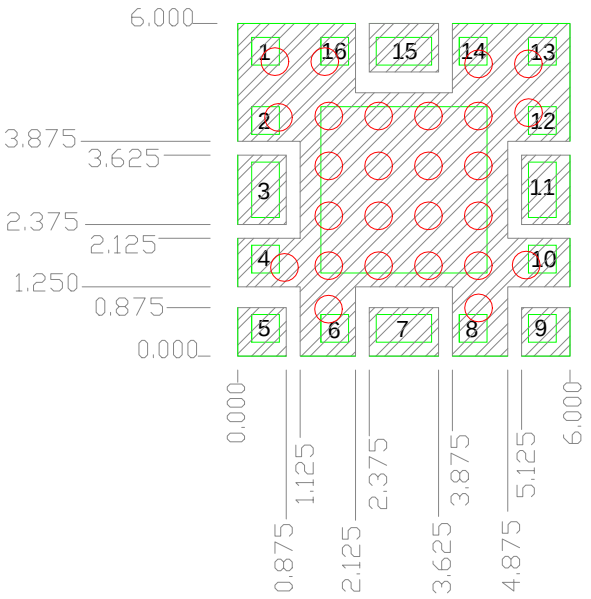


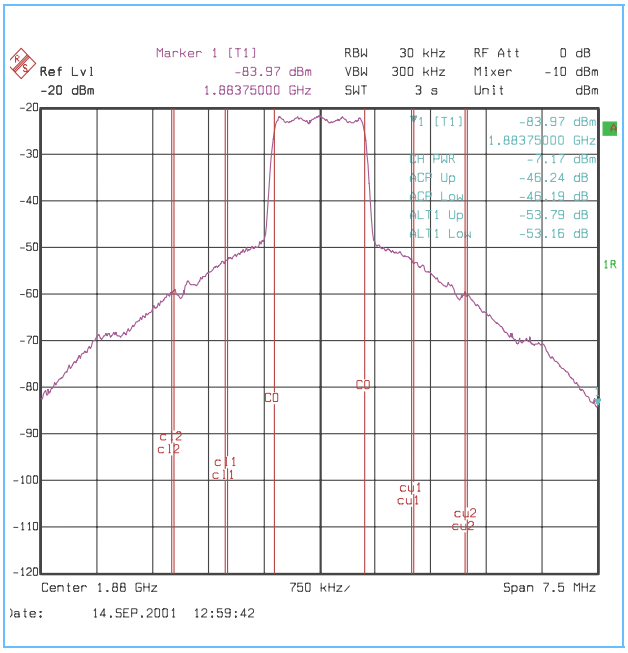
Figure 3. PCB Pad Placement



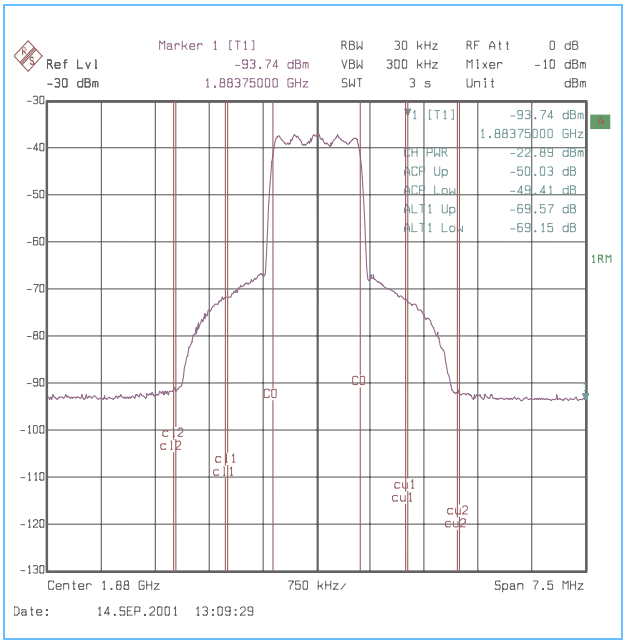
Note: Dimensions are in millimeters. Not to scale. Hatched area show PCB pad. Vias are 0.5 millimeter in diameter. Pin numbers shown as reference.

Appendix: Gain and Power Plots

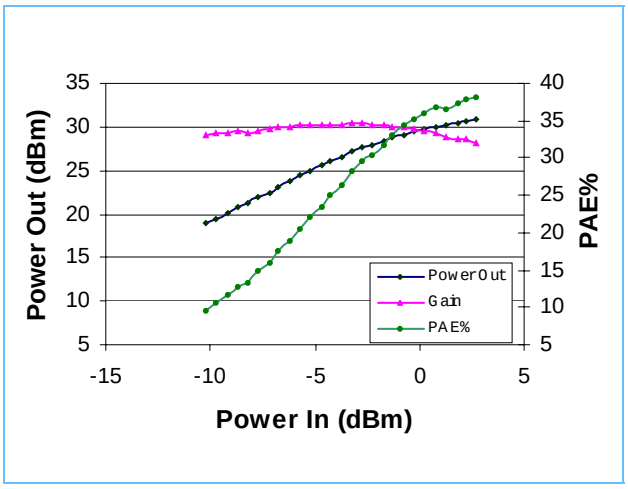
ACPR, High Power Mode



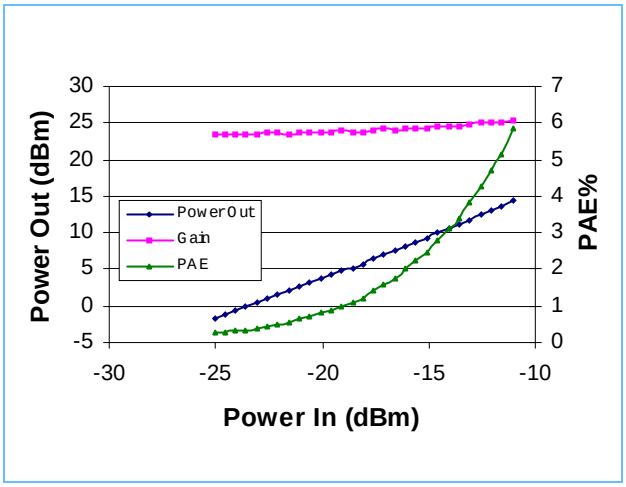
ACPR, Low Power Mode



P_{out}, PAE, Gain vs. P_{in}, High Power Mode



P_{out}, PAE, Gain vs. P_{in}, Low Power Mode



Document Revision Log

Revision Date	Contents of Modification
August 7, 2001	Initial release (00).
November 1, 2001	Revised (01), Kermit_V3
February 21, 2002	Revised (02), Pepe_2PO

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IBM Microelectronics Division
1580 Route 52, Bldg. 504
Hopewell Junction NY 12533-6351

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