

RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

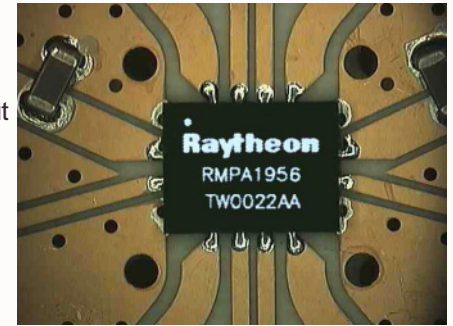
PRODUCT INFORMATION

Description

The RMPA1956-103 is a power amplifier for AMPS, CDMA and CDMA2000-1X personal communications system (PCS) applications. The PA operates over both the Cellular and PCS bands. The PA is internally matched to 50 ohms to minimize the use of external components. Advanced DC power management reduces current consumption during peak phone usage at backed-off RF power levels. High power-added efficiency and excellent linearity are achieved using Raytheon RF Components' Heterojunction Bipolar Transistor (HBT) technology.

Features

- Single positive-supply operation and power-down mode.
- Operates in Cellular and PCS bands
- 33% power-added efficiency at +28 dBm CDMA average output
- Compact LCC package- 6.0 x 8.0 x 1.5 mm³.
- 50 ohm matched and DC blocked input/output.
- Advanced DC Power Management



Absolute Ratings¹

Parameter	Symbol	Min	Max	Units
Supply Voltages	V _{cc} , V _{ca}		5	V
Band Select Voltage	V _{bs}		3.0	V
Power Control Voltage	V _{apc}	0	3.0	V
RF Input Power	P _{in}		+5	dBm
Case Operating Temperature	T _c	-30	+85	°C
Storage Temperature	T _{stg}	-30	+85	°C

Electrical Characteristics²

Parameter	Cellular Band			PCS Band			
	Min	Typical	Max	Min	Typical	Max	Units
Operating Frequency	824		849	1850		1910	MHz
Gain at Po=28 dBm		30			24		dB
Linear Power Output	28			28			dBm
CDMA/CDMA2000-1X PAE		33			31		%
AMPS PAE, Pout=-31dBm		47					%
CDMA ACPR1 ³		-50			-50		dBc
CDMA ACPR2 ⁴		-60			-55		dBc
CDMA2000-1X ACPR1		-47			-47		dBc
CDMA2000-1X ACPR2		-55			-55		dBc
Noise Power (Po≤28dBm)		-135			-135		dBm/Hz
Stability (all spurious) ⁵		-60			-60		dBc
Harmonics (Po ≤28dBm) 2fo, 3fo, 4fo			-30			-30	dBc
Power Shutdown Current ⁶		<1			<1		uA
Input VSWR (50 ohms)		2.0:1			2.0:1		
Case Operating Temp.	-30		+85	-30		+85	°C

Notes:

1. No permanent damage with only one parameter set at extreme limit. Other parameters set to typical values.
2. All parameters met at T_c = +25°C, V_{cc} = +3.5V, f = 1880 MHz and f = 836.5 MHz, and load VSWR ≤ 1.2:1.
3. Po ≤ 28 dBm at V_{cc} = 3.5V; CDMA Waveform measured using the ratio of average power within a 1.23 MHz channel to average power within a 30 kHz bandwidth at +/- 1.25 MHz offset at f = 1880 MHz. Po ≤ 28 dBm at V_{cc} = 3.5V; CDMA Waveform measured using the ratio of average power within a 1.23 MHz channel to average power within a 30 kHz bandwidth at +/- 885 KHz offset at f = 836.5 MHz
4. Po ≤ 28 dBm at V_{cc} = 3.5V; CDMA Waveform measured using the ratio of average power within a 1.23 MHz channel to average power within a 30 kHz bandwidth at +/- 2.25 MHz offset at f = 1880 MHz. Po ≤ 28 dBm at V_{cc} = 3.5V; CDMA Waveform measured using the ratio of average power within a 1.23 MHz channel to average power within a 30 kHz bandwidth at +/- 1.98 MHz offset at f = 836.5 MHz
5. Output VSWR ≤ 6:1, all phase angles.
6. No applied RF signal. V_{cc} = +3.5V nominal, V_{apc} = +0.2V maximum.

RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

PRODUCT INFORMATION

Figure 1
Package Outline

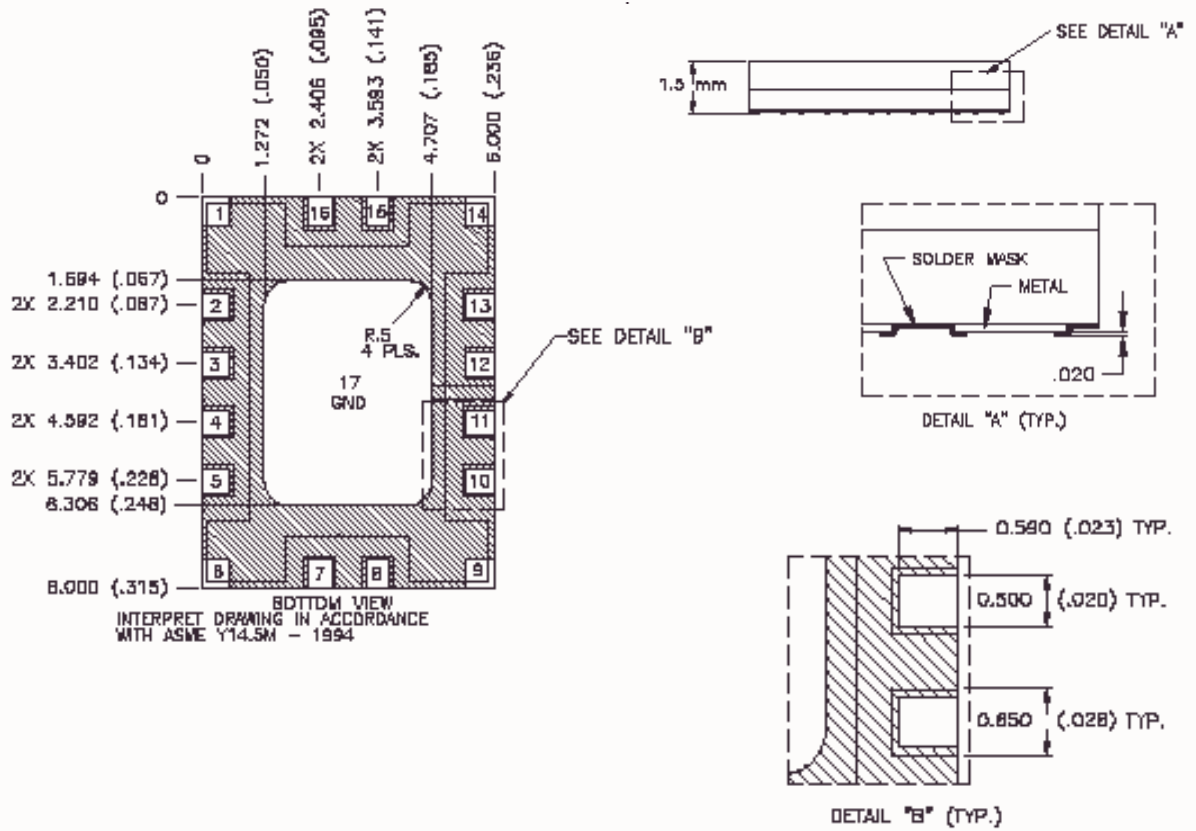
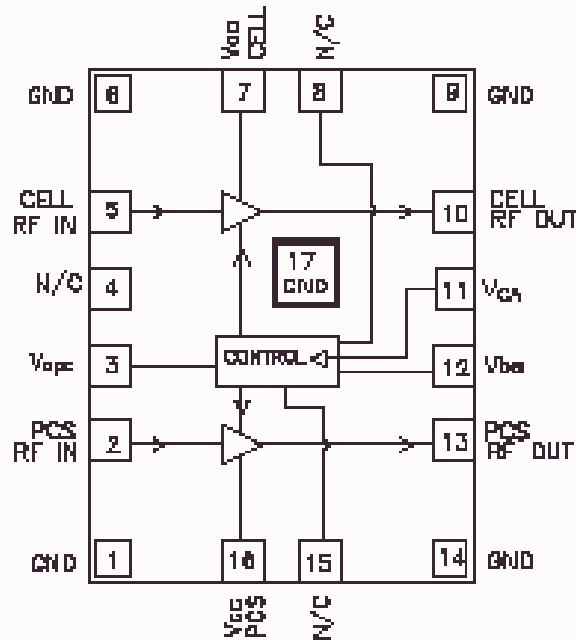


Figure 2
Pinout of
Packaged Product

Top View



RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

PRODUCT INFORMATION

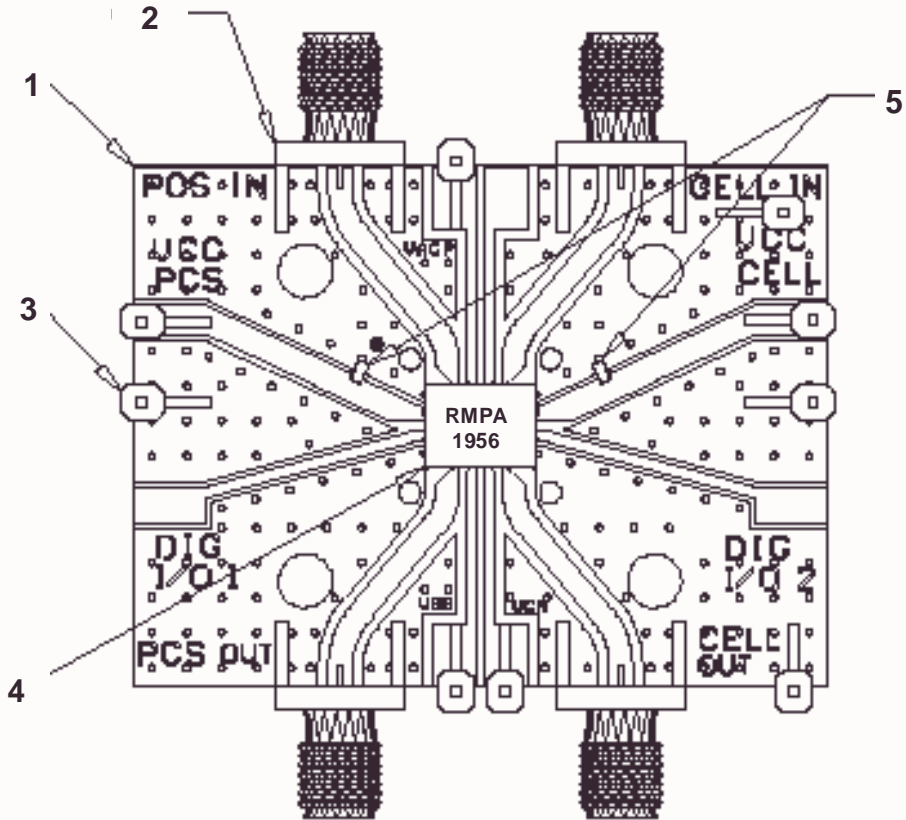
Figure 3
Package Pinout

Section	Signal Name	Description	Pin #
RF	Cell RF In	RF Input to Cell PA; DC blocked; 5 dBm maximum input	5
	PCS RF In	RF Input to PCS PA; DC blocked; 5 dBm maximum input	2
	Cell RF Out	RF Output of Cell PA; DC blocked	10
DC Power	PCS RF Out	RF Output of PCS PA; DC blocked	13
	Vcc Cell	DC Supply for Final Stage Collector of Cellular PA	7
	Vcc PCS	DC Supply for Final Stage Collector of PCS PA	16
	Vca	DC Supply for Control Circuitry	11
		These three DC Power signals may be tied together in the phone.	
Ground	Gnd	Signal Ground	1,6,9,14,17
Control	Vbs	Band Switching	12
	Vapc	Analog Power Control	3

RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

PRODUCT INFORMATION

Figure 4
Evaluation
Board Layout



Qty	Item #	P/N	Description	Vendor
1	1	G857345-1	PC Board	Raytheon
4	2	J1, J2	SMA Conn.	Johnson
8	3	P1 or P2	Terminals	Samtec
1	4	G657342-1	RMPA1956	Raytheon
2	5	C321EDKSR1A335W	3.3uF Capacitor	TDK

RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

Figure 5
Electrical Specifications

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units
Supply Voltage	Vcc, Vca	3.1	3.5	4.5	V
RF Input Power ¹ (either band)	Pin		0	+3	dBm
CDMA Output Power Range	Pout	-55		+28	dBm
Band Switch Voltage	Vbs	0	2		V
Analog Power Control	Vapc	0	2.6		V

Notes:

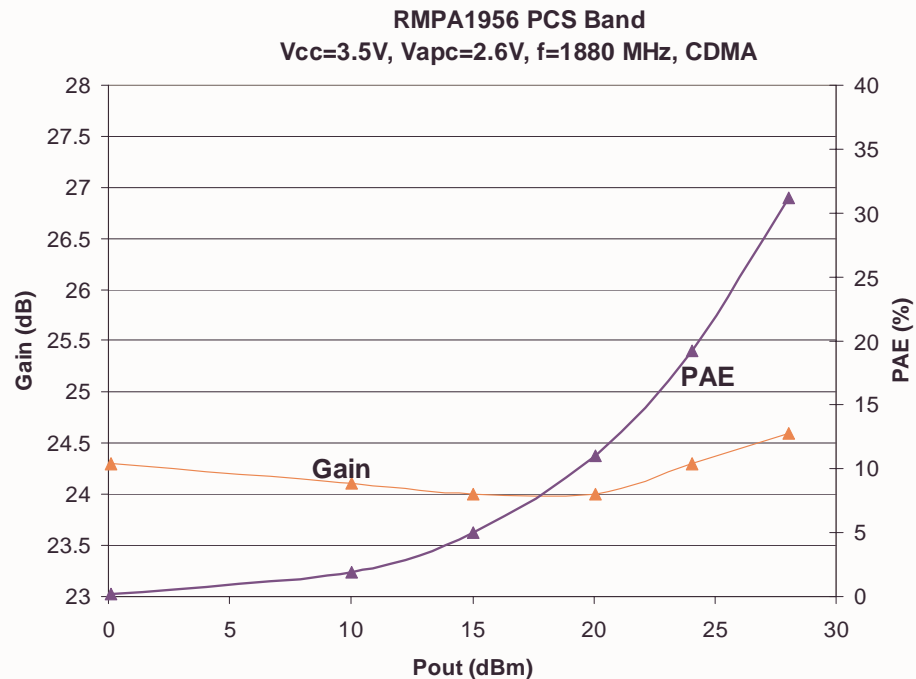
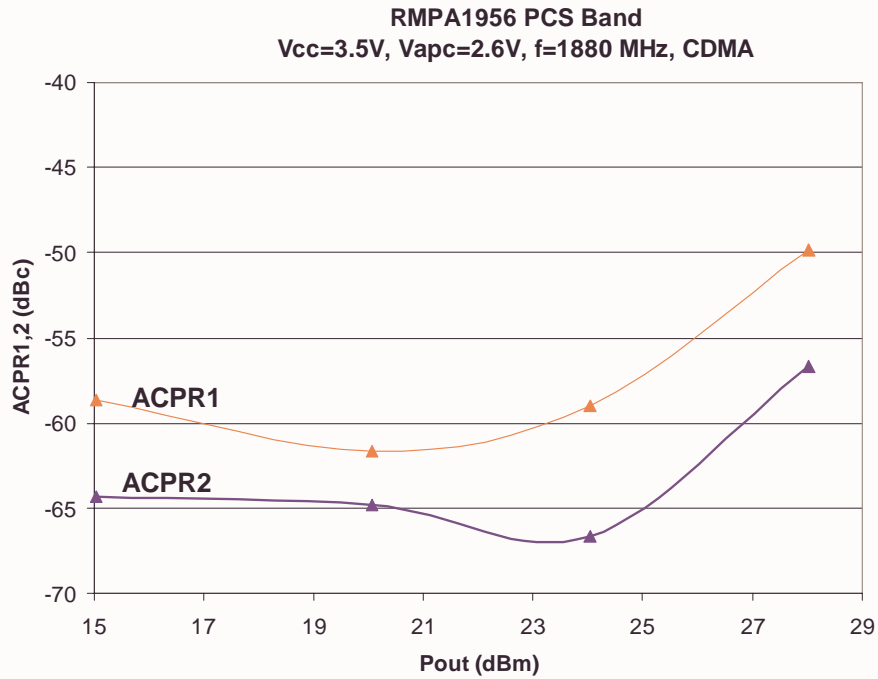
1. Typical RF input power for CDMA Pout = +28dBm.

Figure 6
Operational Control

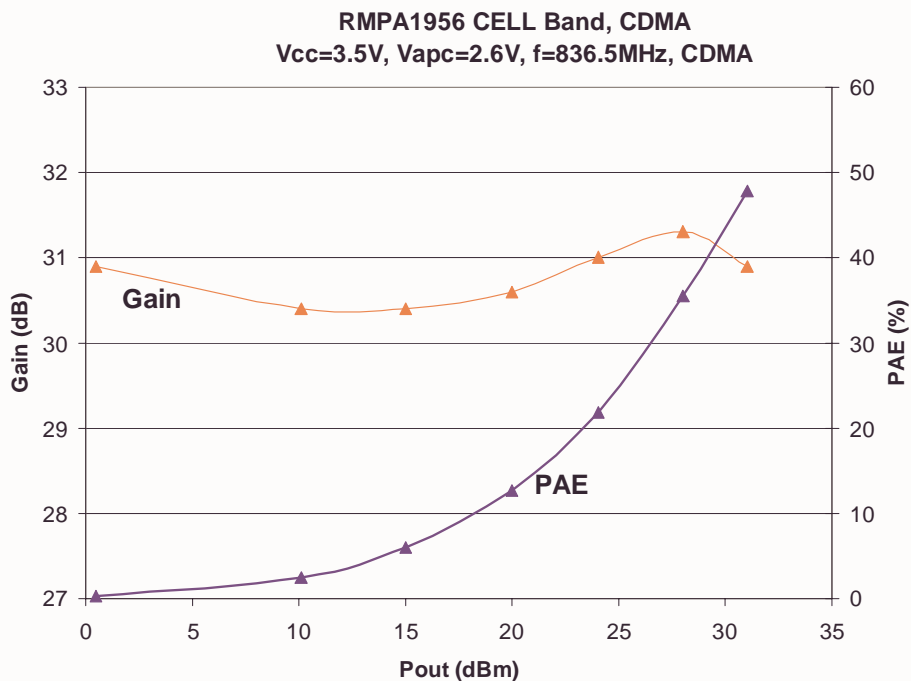
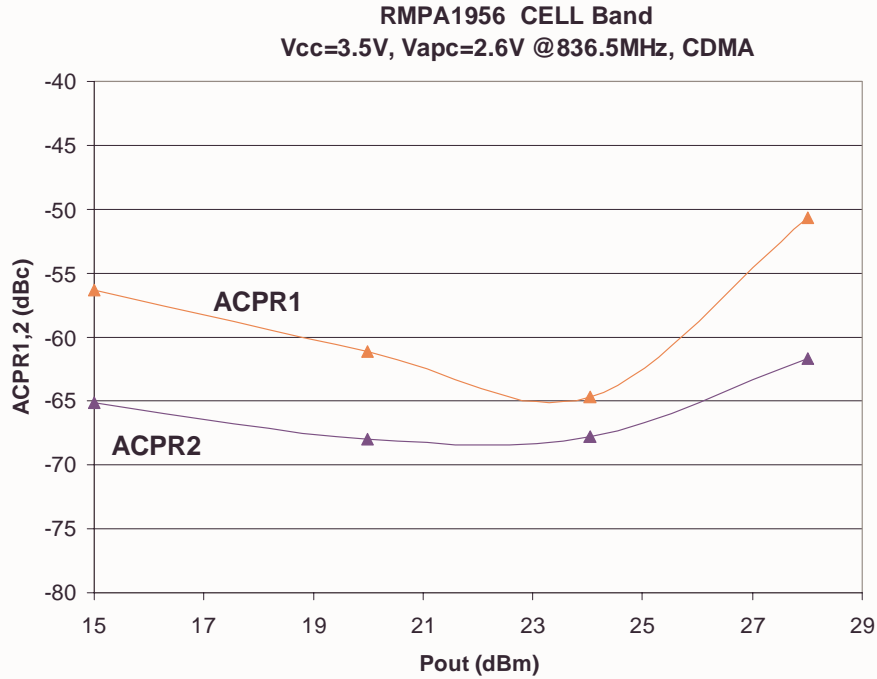
Band & Power	Vcc	Vapc	Vbs
Cell 28 dBm	3.5V	2.6V	>2.0V
Cell <28 dBm	3.5V	0.7 – 2.0V	>2.0V
PCS 28 dBm	3.5V	2.6V	0V
PCS <28 dBm	3.5V	0.7 – 2.0V	0V
Shutdown	3.5V	0V	X

RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

PRODUCT INFORMATION

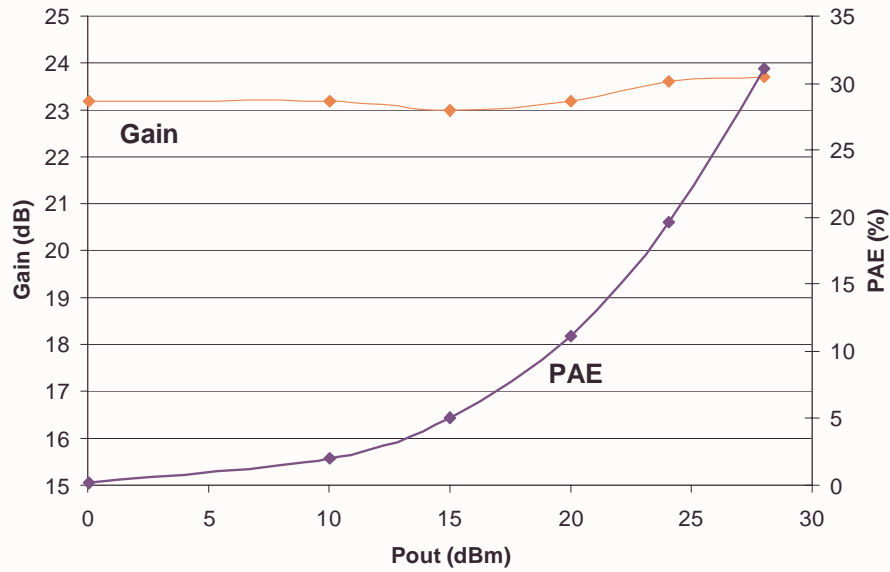


RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

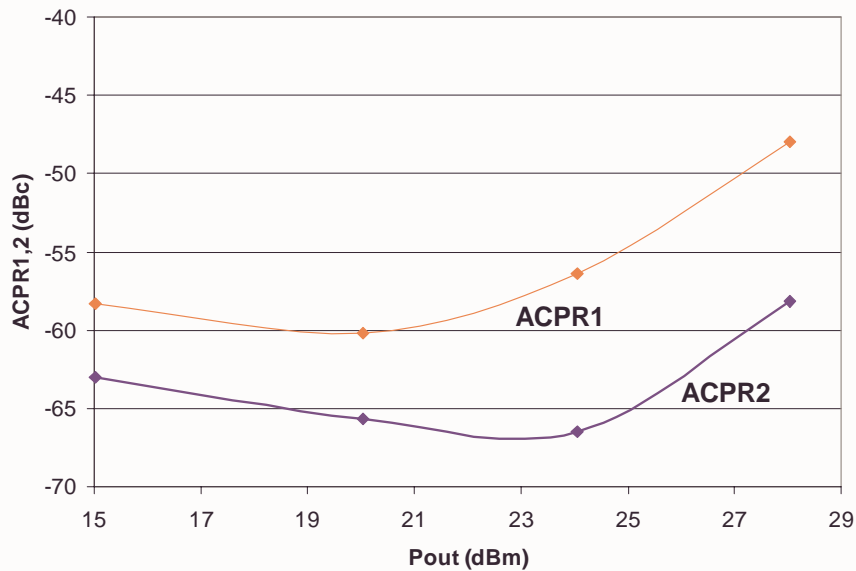


RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

RMPA1956 CDMA2000-1X PAE and Gain
Vcc=3.5V, Vapc=2.6V, f= 1880 MHz

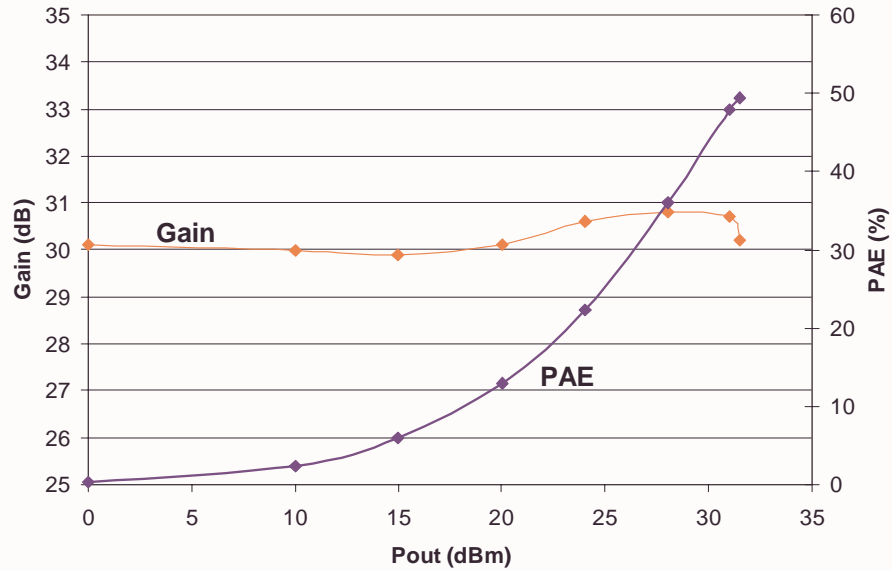


RMPA1956 CDMA2000-1X ACPR1&2
Vcc=3.5V, Vapc=2.6V, f=1880 MHz

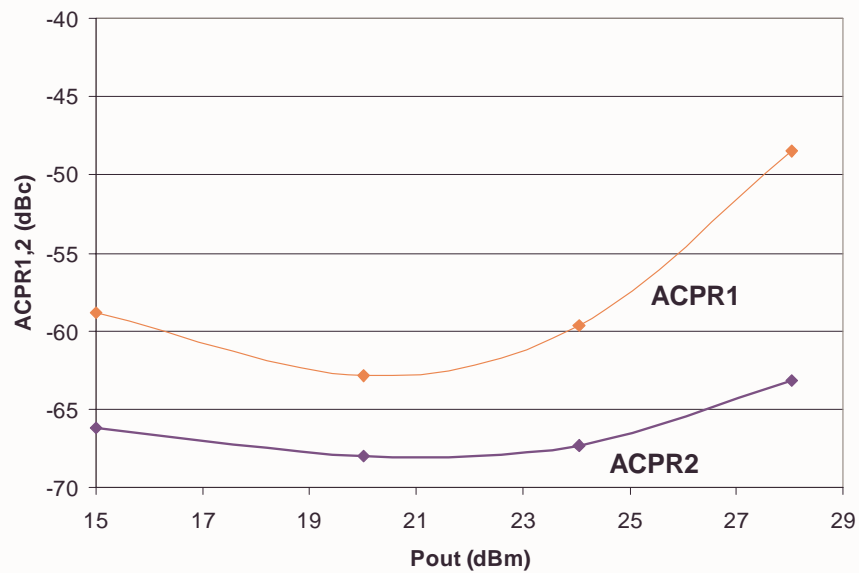


RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

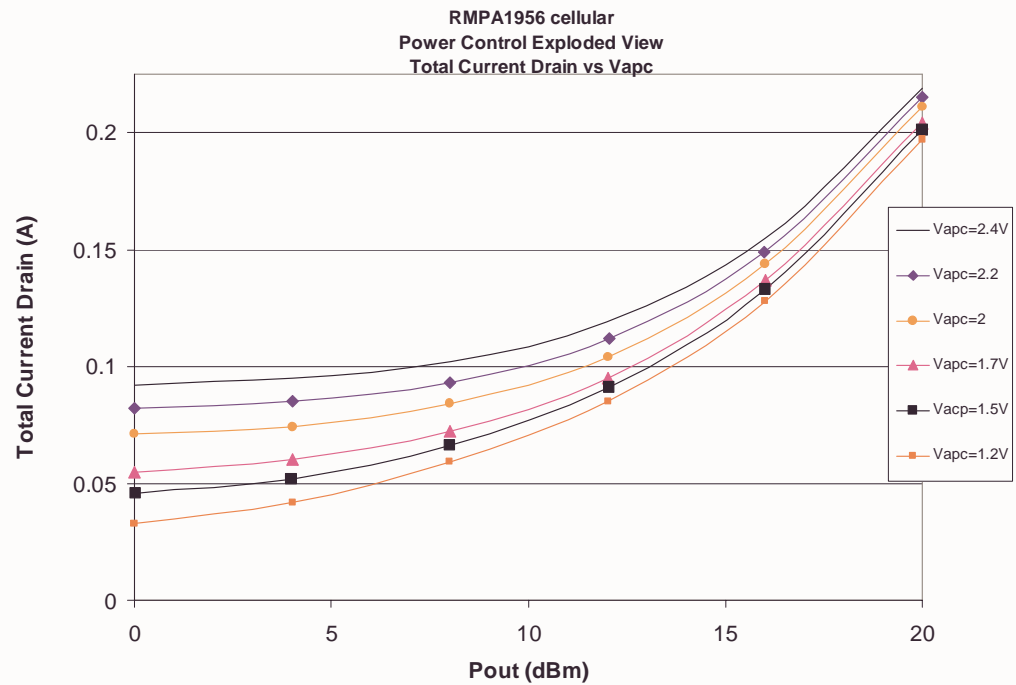
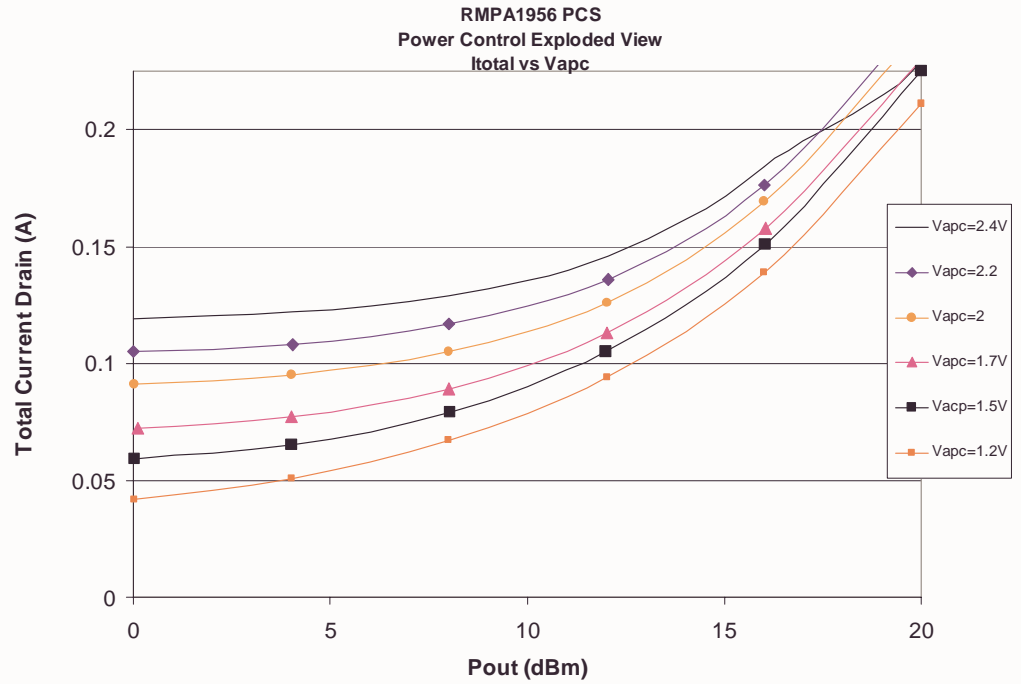
RMPA1956 CDMA2000-1X PAE and Gain
Vcc=3.5V, Vapc=2.6V, f=836.5MHz



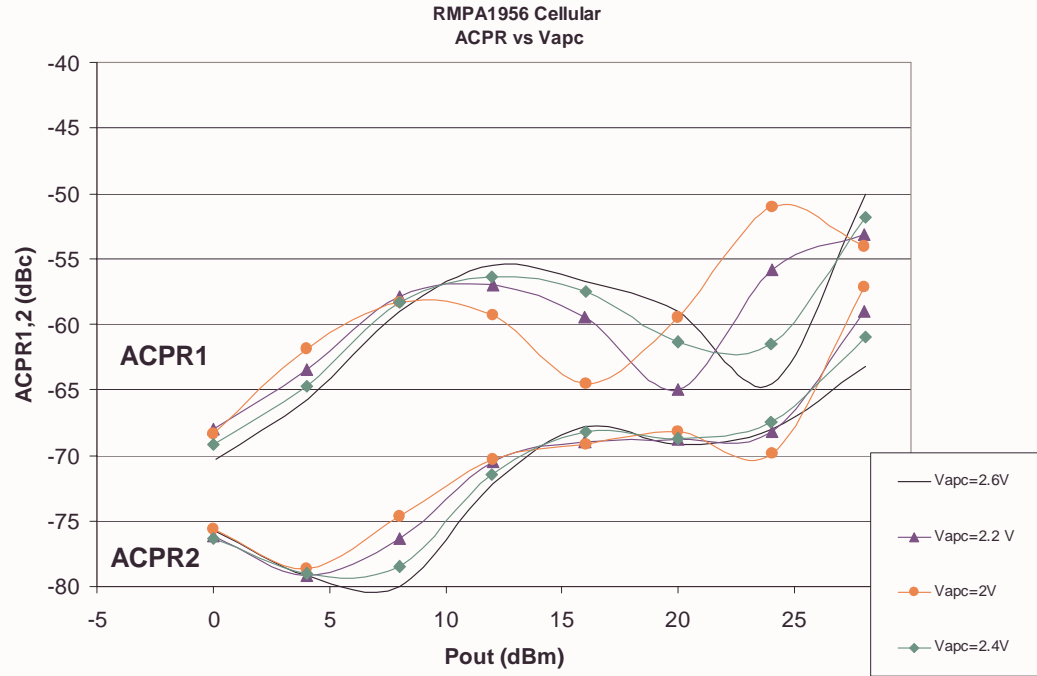
RMPA1956 CDMA2000-1X ACPR1&2
Vcc=3.5, Vapc=2.6V, f=836.5MHz



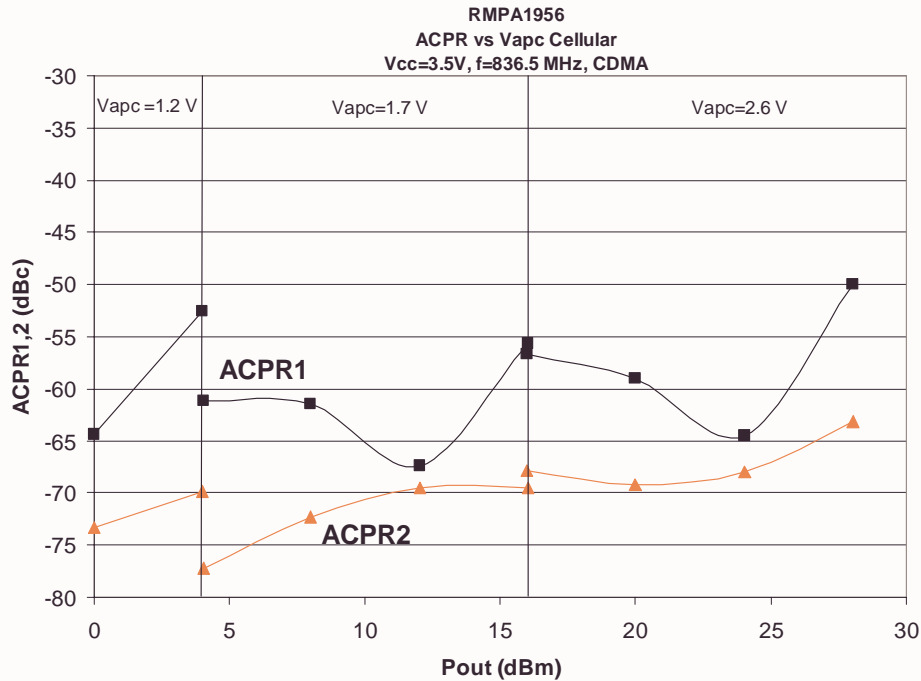
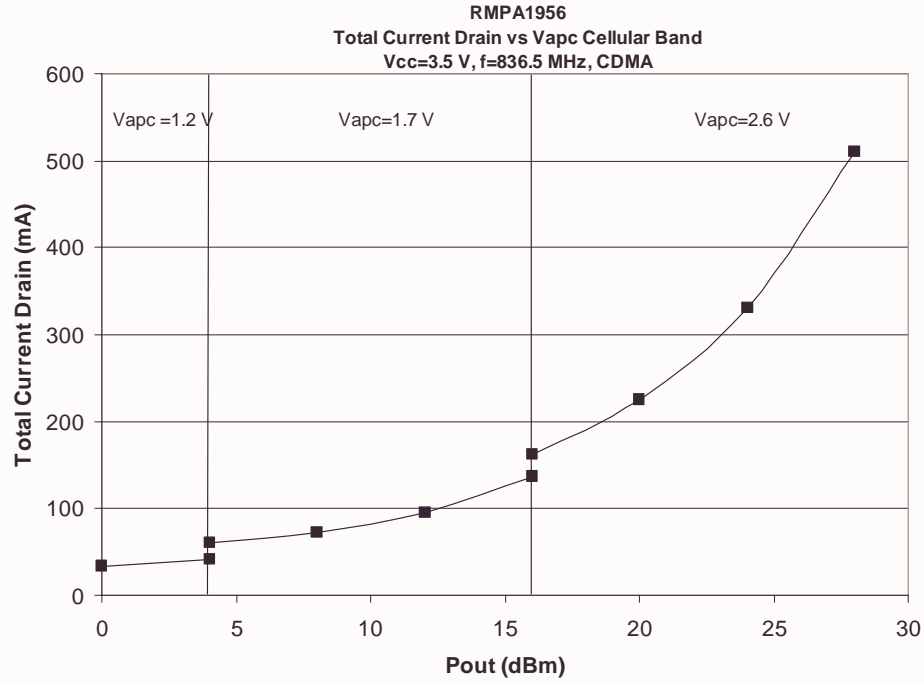
RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module



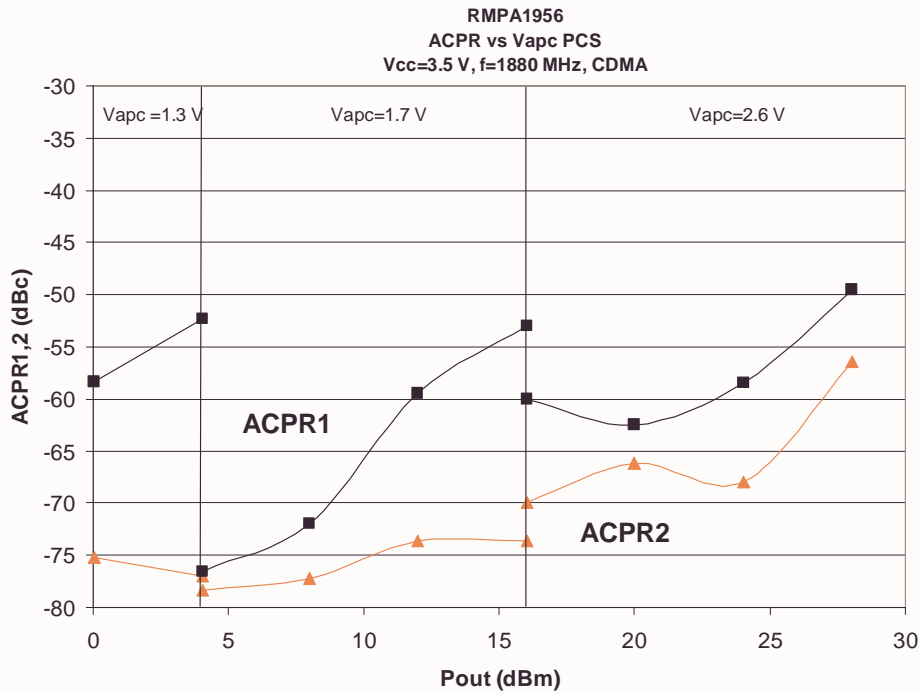
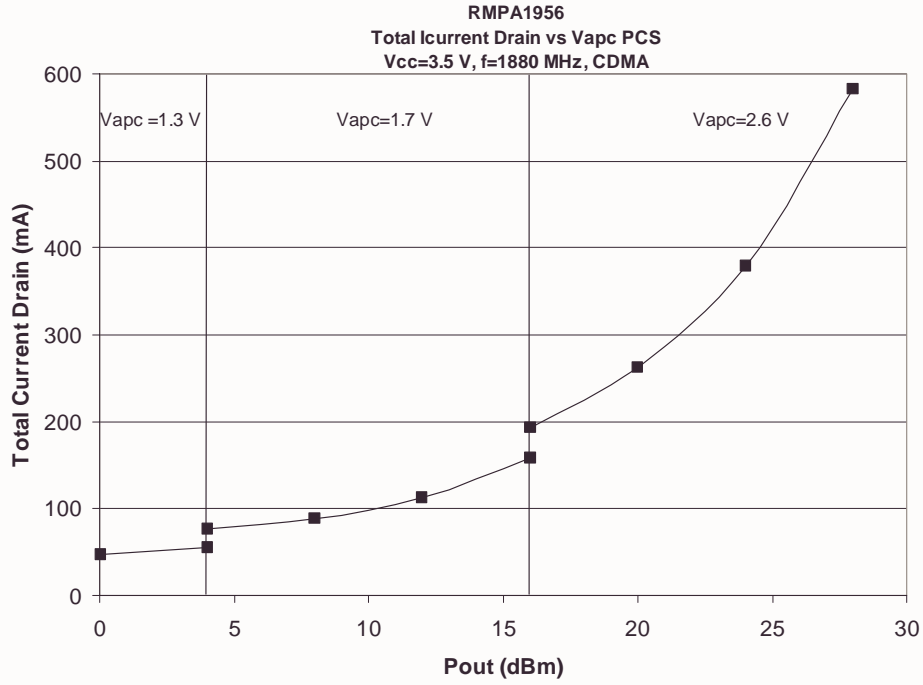
RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module



RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module



RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module



RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

PRODUCT INFORMATION

Application Information

Precautions to Avoid Permanent Device Damage:

Cleanliness: Observe proper handling procedures to ensure clean devices and PCBs. Devices should remain in their original packaging until component placement to ensure no contamination or damage to RF, DC & ground contact areas.

Device Cleaning: Standard board cleaning techniques should not present device problems provided that the boards are properly dried to remove solvents or water residues.

Static Sensitivity: Follow ESD precautions to protect against ESD damage:

A properly grounded static-dissipative surface on which to place devices.
Static-dissipative floor or mat.

A properly grounded conductive wrist strap for each person to wear while handling devices.

General Handling: Handle the package on the top with a vacuum collet or along the edges with a sharp pair of bent tweezers. Avoiding damaging the RF, DC, & ground contacts on the package bottom. Do not apply excessive pressure to the top of the lid.

Device Storage: Devices are supplied in heat-sealed, moisture-barrier bags. In this condition, devices are protected and require no special storage conditions. Once the sealed bag has been opened, devices should be stored in a dry nitrogen environment.

Device Usage: Raytheon recommends the following procedures prior to assembly.

Dry-bake devices at 125°C for 24 hours minimum. Note: The shipping trays cannot withstand 125°C baking temperature.

Assemble the dry-baked devices within 7 days of removal from the oven.

During the 7-day period, the devices must be stored in an environment of less than 60% relative humidity and a maximum temperature of 30°C

If the 7-day period or the environmental conditions have been exceeded, then the dry-bake procedure must be repeated.

Solder Materials & Temperature Profile: Reflow soldering is the preferred method of SMT attachment. Hand soldering is not recommended.

Reflow Profile

Ramp-up: During this stage the solvents are evaporated from the solder paste. Care should be taken to prevent rapid oxidation (or paste slump) and solder bursts caused by violent solvent out-gassing. A typical heating rate is 1- 2°C/sec.

Pre-heat/soak: The soak temperature stage serves two purposes; the flux is activated and the board and devices achieve a uniform temperature. The recommended soak condition is: 120-150 seconds at 150°C.

RMPA1956-103 - 3.5 V Dual Band Tri-Mode AMPS, CDMA & CDMA2000-1X Power Amplifier Module

PRODUCT INFORMATION

Application Information (Cont)

Reflow Zone: If the temperature is too high, then devices may be damaged by mechanical stress due to thermal mismatch or there may be problems due to excessive solder oxidation. Excessive time at temperature can enhance the formation of inter-metallic compounds at the lead/board interface and may lead to early mechanical failure of the joint. Reflow must occur prior to the flux being completely driven off. The duration of peak reflow temperature should not exceed 10 seconds. Maximum soldering temperatures should be in the range 215-220°C, with a maximum limit of 225°C.

Cooling Zone: Steep thermal gradients may give rise to excessive thermal shock. However, rapid cooling promotes a finer grain structure and a more crack-resistant solder joint. The illustration below indicates the recommended soldering profile.

Solder Joint Characteristics: Proper operation of this device depends on a reliable void-free attachment of the heatsink to the PWB. The solder joint should be 95% void-free and be a consistent thickness.

Rework Considerations: Rework of a device attached to a board is limited to reflow of the solder with a heat gun. The device should not be subjected to more than 225°C and reflow solder in the molten state for more than 5 seconds. No more than 2 rework operations should be performed.

Recommended Solder Reflow Profile

