PACIFIC MONOLITHICS®

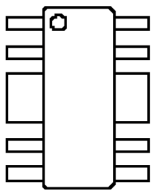
A Division of Richardson Electronics

PM 2117AB
DATA SHEET

APPLICATION NOTE 2117AB
Linear and Saturated Operation

Introduction

The purpose of this application note is to provide an understanding of Pacific Monolithics' PM2117 power amplifier for Class A (saturated) and Class AB (linear) modes of operation and is intended to be a supplement to the PM2117 data sheet. Refer to the PM2117 data sheet for electrical characteristics, maximum ratings, performance curves, pcb layout, schematic diagram, thermal characteristics and mechanical information not covered within this application note.



Principles of Operation

The PM2117 is a two-stage GaAs MESFET power amplifier designed to provide near 1 watt saturated output performance from 2400 to 2500 MHz operating in a Class A mode using a single 5 Vdc supply. The PM2117 RFIC includes on-chip input and interstage matching and only requires eight external components for output matching and bypassing.

In Class A mode both FET stages are biased at 0 volts V_{GS} and with no RF signal applied the DC current = I_{DSS} (550 mA). An RF input signal > 5 dBm is required to saturate the output FET (2nd stage). The operating DC current is reduced by approximately 30% due to the shift in the DC component of the large signal waveform. The practical use of the PM2117 for linear performance in this "grounded gate", Class A mode of operation is limited due to thermal issues. The maximum allowable power dissipation of the PM2117 is 1.9 Watts at 85 C, whereas: Power Dissipation = (DC Power) - (RF Output Power). If the RF input signal is " backed off " to a level less than - 2 dBm for linear operation, the maximum power dissipation of the PM2117 will be exceeded under Class A 5 Vdc operation at 85 C.

Supplying a single negative voltage (0.3 Vdc) to pin 5 of the PM2117, as shown in the data sheet, will allow for a linear Class AB operation. This provides for lower current consumption during an "idle" or low power output mode. Using the PM2117 in this Class AB mode maintains an advantage over traditional deep depletion mode devices since it does not require two negative supply voltages or sequencing circuits for safe operation. Operating Class AB insures reliable performance over all power levels and temperature range and maintains the PM2117 RFIC channel temperature less than 150 C at 85 C package lead temperature.

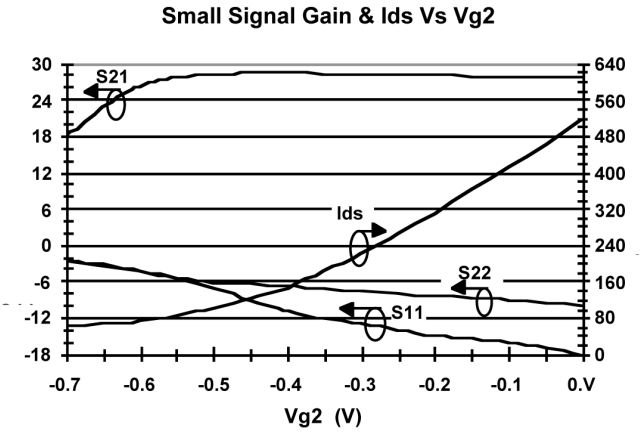
Typical Characteristics for PM2117 Class AB Operation

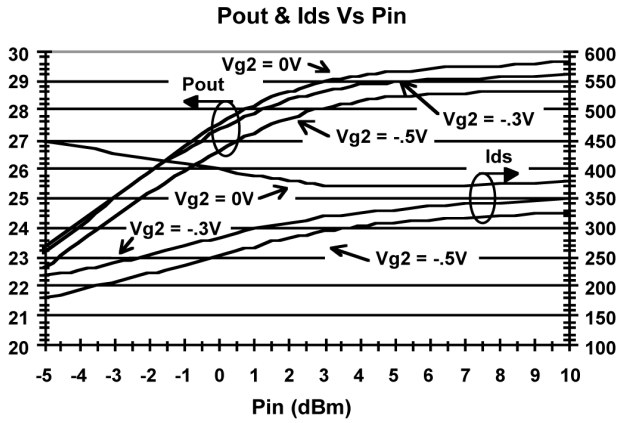
Test Conditions: V_{DD} = 5V, V_{G2} = - 0.3V, f = 2440 MHz. @ 25 C

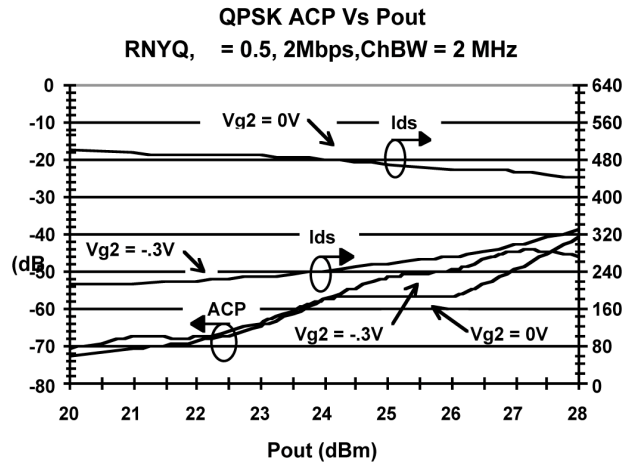
Parameter	Symbol	Conditions	Typ	Units
Output Power at 1dB Comp.	P_{1dB}		27.5	dBm
Operating Drain Current	I_{DD}	$P_{OUT} = P_{1dB}$	300	mA
Idle Current	I_Q	No RF Input	200	mA
Two-Tone Intercept Point	IP_3	f = 2 MHz	35	dBm
Adjacent Channel Power	ACP	$P_{OUT} = P_{1dB}$, QPSK, RNYQ, =0.5, BR = 2 Mbs, 2 MHz Offset	- 45	dBc
Small Signal Gain	G	P_{OUT} = -10 dBm	27	dB
Input Return Loss	S_{11}	50 System	- 12	dB
Stability Factor	k	Minimum, 0.5 to 6 GHz	1.5	

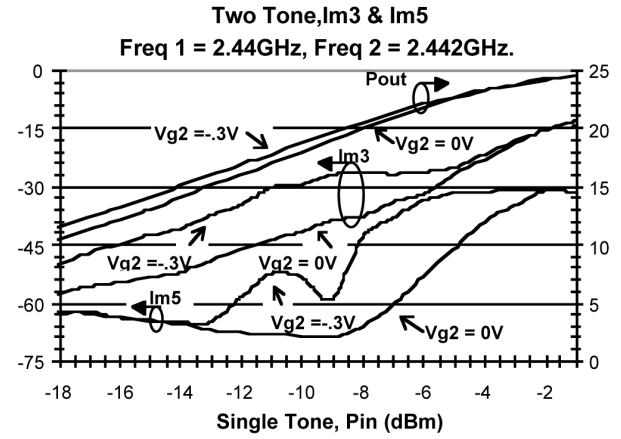
Performance Characteristics at 2.44 GHz

Class A (Grounded Gate; V_{G2} = 0 V), Class AB (V_{G2} =-0.3V)

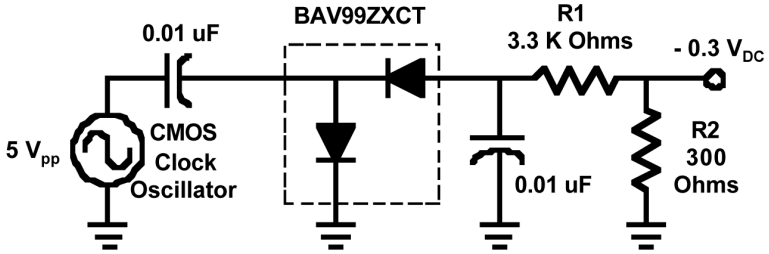








Typical Negative Voltage Supply Generator



This simple network will supply the required negative voltage (V_{G2}) for operating the PM2117 in Class AB mode. The values of the voltage divider network, R1 and R2, can be changed to provide voltages between 0 and -5 Vdc.