



250 mW S-Band Power Amplifier, 2.2 - 2.4 GHz

V 1P.00

Preliminary

MA05535-DIE

Features

- High Linear Gain: 29 dB typ.
- High Saturated Output Power: +24 dBm typ.
- 50 Ohm Input/Output Matched
- InGaP HBT Process

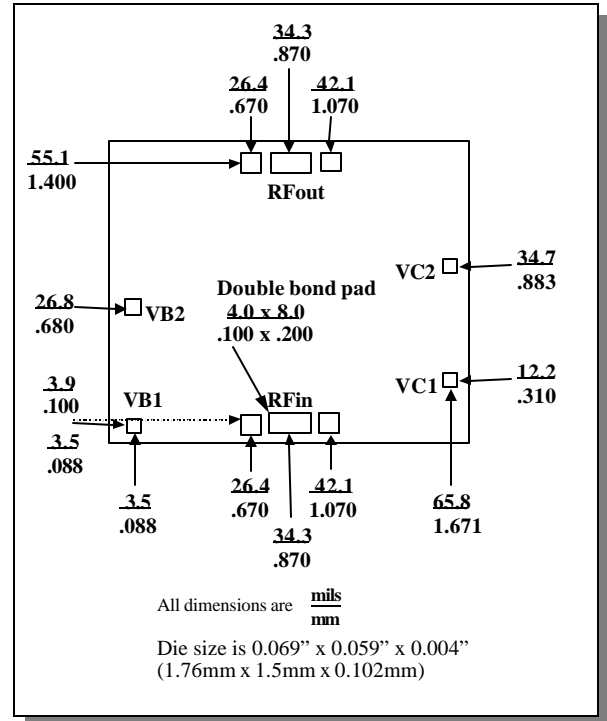
Description

M/A-COM's MA05535-DIE is a two-stage MMIC power amplifier in die form. The MA05535-DIE has fully matched input and output networks. The MA05535-DIE is designed to operate from a constant voltage collector supply. By varying the bias conditions, the saturated output power performance of this device may be tailored for various applications.

The MA05535-DIE is ideally suited for use as an output stage in telemetry systems. The MA05535-DIE requires only supply line bypassing and base resistors, minimizing the number of external components required.

M/A-COM's MA05535-DIE is fabricated using an InGaP HBT process. The process features full passivation for increased performance and reliability. This product is 100% RF tested to ensure compliance to performance specifications.

OUTLINE DRAWING



Electrical Specifications: $V_{cc} = +3V$, $Z_o = 50 \text{ Ohms}$, $T_A = 25^\circ C$

Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
Linear Gain	Pin = -20 dBm	2.2 - 2.4 GHz	dB	—	29	—
Input VSWR	Pin = -20 dBm	2.2 - 2.4 GHz	Ratio	—	—	2.0:1
Output VSWR	Pin = -20 dBm	2.2 - 2.4 GHz	Ratio	—	—	2.0:1
Output Power (Saturated)	Pin = +10 dBm	2.2 - 2.4 GHz	dBm	—	24	—
Output Power vs. Frequency	Pin = +10 dBm	2.2 - 2.4 GHz	dB	—	—	± 0.4
Output Power vs. Temperature	$T_A = -40^\circ C$ to $+85^\circ C$, Pin = +10 dBm	2.2 - 2.4 GHz	dB	—	—	± 0.8
Collector Bias Current	Pin = +10 dBm	2.2 - 2.4 GHz	mA	—	400	—
Base Bias Current	Pin = +10 dBm	2.2 - 2.4 GHz	mA	—	5	—
Power Added Efficiency	Pin = +10 dBm	2.2 - 2.4 GHz	%	—	24	—

Absolute Maximum Ratings ^{1,2}

Parameter	Absolute Maximum
Input Power	+13 dBm
V _{CC}	+12 volts
V _{BB}	-8 volts to +6 volts
I _{CC}	600 mA
Max. Dissipation Power	1350 mW
Channel Temperature	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

1. Operation of this device above any one of these parameters may cause permanent damage.
2. Adequate heat sinking and grounding required.

Handling

Permanent damage to the MA05535-DIE may occur if the following precautions are not adhered to:

- A. Cleanliness – The MA05535-DIE should be handled in a clean environment. DO NOT attempt to clean assembly after the MA05535-DIE is installed.
- B. Static Sensitivity – All die handling equipment and personnel should comply with DOD-STD-1686 Class I.
- C. Transients – Avoid instruments and power supply transients while bias is connected to the MA05535-DIE. Use shielded signal and bias cables to minimize inductive pick-up.
- D. D. General Handling – DO NOT touch the surface of the die. It is recommended that the MA05535-DIE die be handled along the long side with a sharp pair of tweezers.

Mounting

The MA05535-DIE is back-metallized with Pd/Ni/Au (100/1000/30000Å) metallization. It is recommended that the die be mounted with Au/Sn eutectic preforms. The attachment surface should be clean and flat.

- A. An 80/20 preform is recommended with a work surface temperature of approximately 255°C and a tool temperature of 265°C. When hot 90/5 nitrogen/hydrogen gas is applied, solder temperature should be approximately 290°C.
- B. DO NOT expose the MA05535-DIE to a temperature greater than 320°C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.

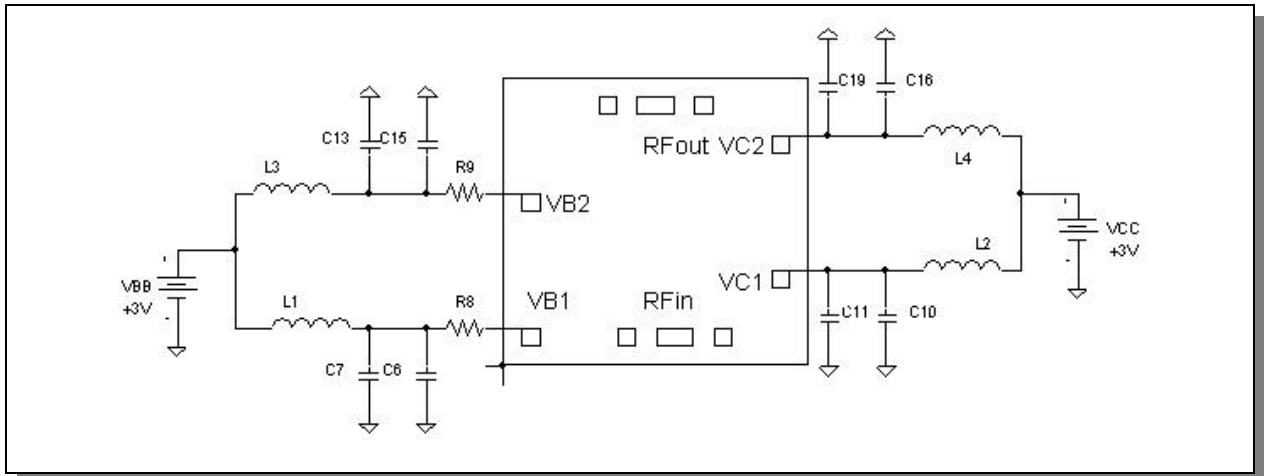
Bonding

- A. Ball or wedge bond with 1.0 mil diameter gold wire or 3.0 mil x 0.5 mil ribbon. Thermosonic bonding with a nominal stage temperature of 150°C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Ultrasonic energy and time should be adjusted to the minimum levels necessary to achieve reliable bonds.
- B. Bonds should be started on the die and terminated on the package.
- C. Bonding pads are 3.0 mil x 3.0 mil minimum.

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Recommended Bias Configuration ^{3,4}

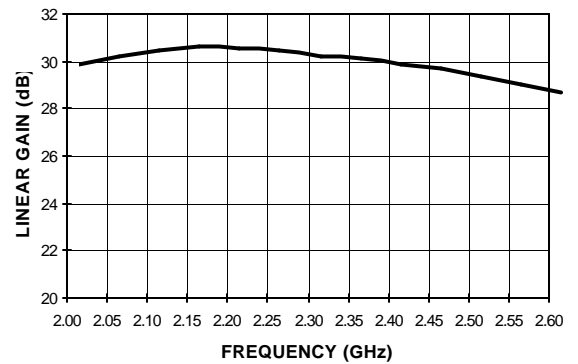


3. Apply +3 volts V_{CC} . Adjust V_{BB} by changing the resistors, R6 and R7, for desired base current.
4. For optimum IP3 performance, V_{CC} bypass capacitors should be placed within 0.5 inches of the V_{CC} leads.

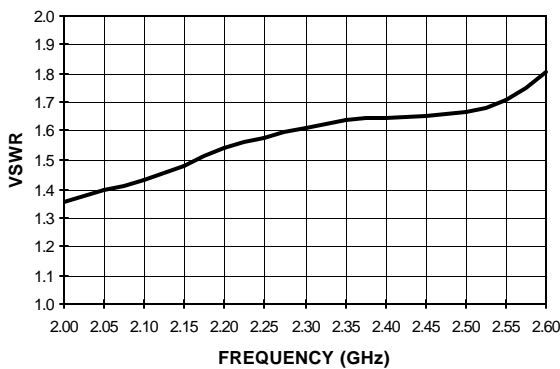
Component	Value
R8	3.3K Ohm
R9	330 Ohm
L1, L3	220 nH
L2, L4	270 nH
C11, C19	9 pF
C6, C15	100 pF
C7, C10, C13, C16	0.1 μ F

Typical Performance Curves

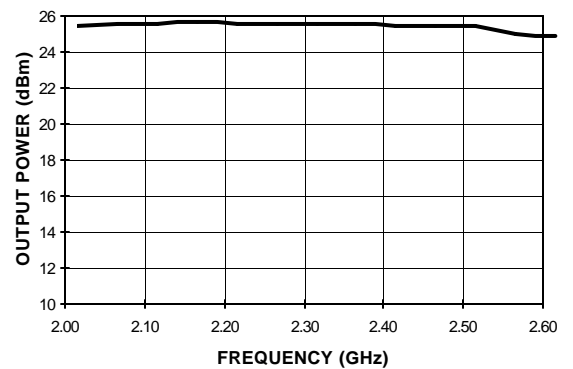
Linear Gain vs. Frequency



VSWR vs. Frequency



Saturated Output Power vs. Freq. (PIN = +10 dBm)



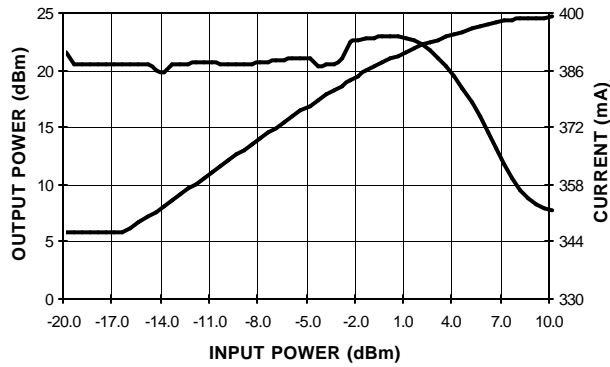
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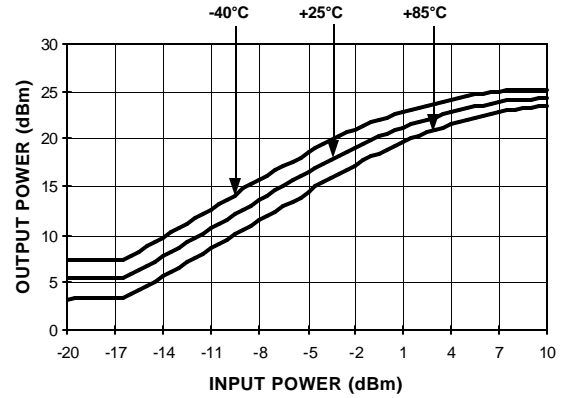
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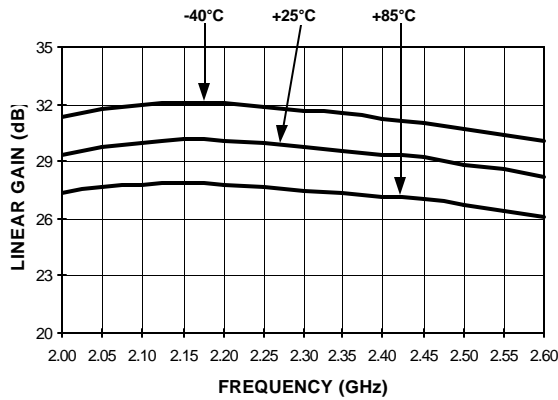
Output Power and ICC vs. Input Power



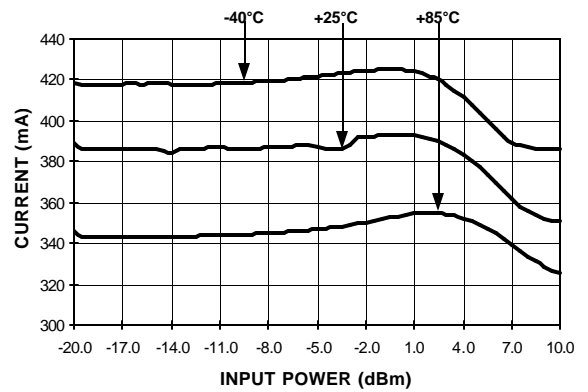
Output Power vs. Input Power and Temperature



Linear Gain vs. Frequency and Temperature



Collector Current vs. Input Power and Temperature



Ordering Information

Part Number	Package
MA05535-DIE	Die Form

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