GaN Hybrid Power Amplifier HM0225-05B

RFHIC

Product Features

- GaN on SiC HEMT
- 2-stage, In/Out 50Ω Impedance Matching
- Surface Mount Hybrid Type
- Compact Size & Low Weight
- High Efficiency
- Low Cost
- Custom design available

Applications

- Radio System

RoHS Comply

Package Type : NP-1A

Description

HM0225-05B provides high RF performances from 200 ~ 2500MHz. The solution was developed for SDR (Software Defined Radio), TRS (Trunked Radio Service), and other communication applications. Metal-Lid and AlN-board are utilized for thermal dissipation.

Electrical Specifications @V_{ds1} =+8V, V_{ds2} =+24V(200~2400MHz), +28V(2400~2500MHz), V_{gs2}@Idq2, Ta=25℃, including External Circuit (See Page 3)

PARAMETER	UNIT	MIN	TYP	MAX	CONDITION	
Frequency Range	MHz	200	-	2500	ZS = ZL = 50 ohm	
Output Power	dBm	37	-	-	200~2500MHz	Idq1 = 180mA Idq2 = 250mA Pout = 37dBm External Circuit
Power Gain	dB	33	-	-	200~1000MHz	
		34	-	-	1000~2000MHz	
		34.5	-	-	2000~2400MHz	
		35	-	-	2400~2500MHz	
PAE	%	31	-	-	200~2500MHz	
IMD	dBc	-19	-25	-	Pout=31dBm (each tone) Two-tone space=1MHz	
Input Return Loss (S11)	dB	-5	-10		Idq1=180mA, Idq2=250mA	
Supply Voltage	V	-	8	9	Vds1	
		-	Vgs2@Idq2	-	Vgs2	
		-	24	28	Vds2	

Caution

The drain voltage must be supplied to the device after the gate voltage is supplied.

Turn on : Turn on the Gate Voltage supply and last turn On the Drain voltage supplies.

Turn off : Turn off the Drain Voltage and last turn off the Gate voltage.

Note

HM Series have internal DC blocking capacitors at the RF input and output ports.

Recommended External Circuit should be applied. (page 3)

Mechanical Specifications

PARAMETER	UNIT	TYP	REMARK
Mass	g	2	-
Dimension	mm	21.1 x 10.6 x 2.5	Outermost

Absolute Maximum Ratings

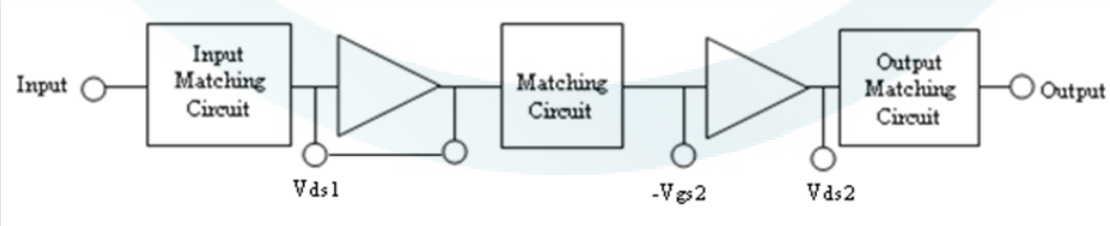
PARAMETER	UNIT	RATING	SYMBOL
Gate-Source Voltage	V	-10 ~ 0	Vgs2
Drain-Source Voltage	V	50	Vds2
Gate Current	mA	3.6	Ig2
Operating Junction Temperature	°C	225	T_J
Operating Case Temperature	°C	-40 ~ 85	T_C
Storage Temperature	°C	-55 ~ 100	T_{STG}
Stability into mismatch	-	Stable into VSWR ≤ 10:1 (from 100kHz to 8.5GHz at all phase angles at Pin=-30dBm ~ +4dBm and Vds1= 8V~9V and Vds2=12~24V)	-

Operating Voltages

PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain Voltage 1	V	-	8	9	Vds1
Drain Voltage 2	V	-	24	28	Vds 2
Gate Voltage 2 (on-state)	V	-	Vgs2@Idq2	-1.5	Vgs 2
**** Gate Voltage 2 (off-state)**	V	-	-5	-	Vgs 2

** Gate Voltage 2 (off-state) condition is defined without any RF signal at the input (pin #1).

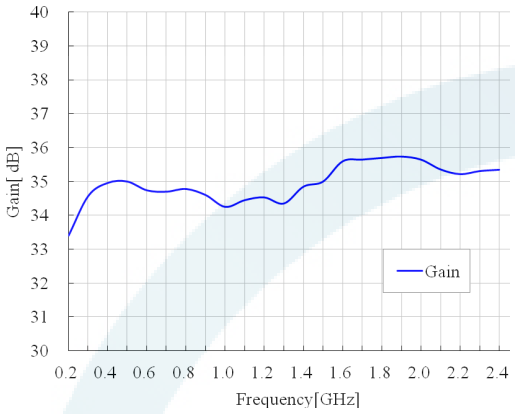
Block Diagram



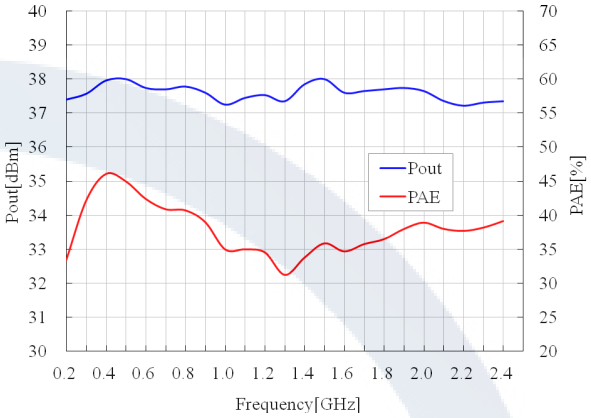
Performance Charts

*** Bias condition** @ Idq1=180mA, Vds1=+8V, Idq2=250mA, Vgs2@Idq2, Vds2 =+24V, Ta=25℃

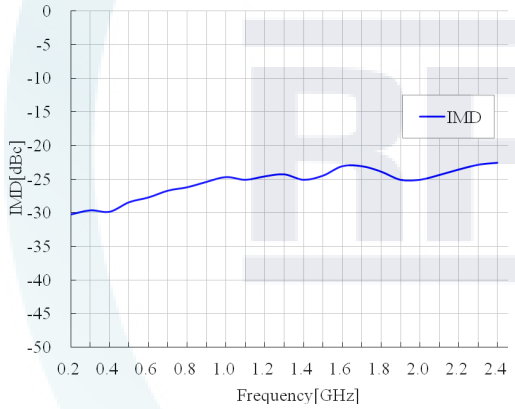
Power Gain @ Pout>37dBm vs. Frequency



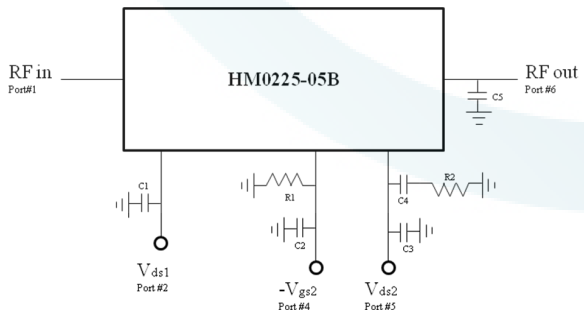
Total PAE @ Pout>37dBm vs. Frequency



IMD vs. Frequency **(each-tone of 31dBm and two-tone space of 1MHz)**



*** Recommended External Circuit**



C1, C2, C3: 100nF

C4: 56pF

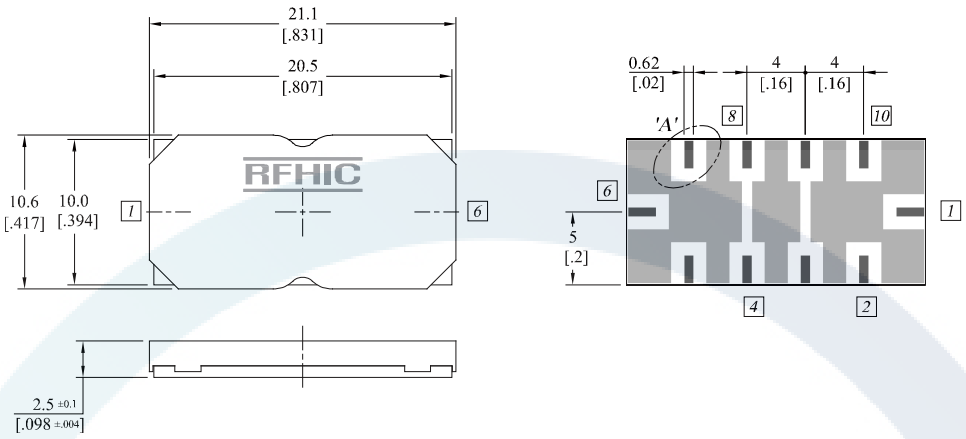
C5: 0.7pF (HiQ)

R1: 2.2kOhm

R2: 4.7kOhm

Package Dimensions (Type: NP-1A)

* Unit: mm[inch] | Tolerance: ±0.15[.006]

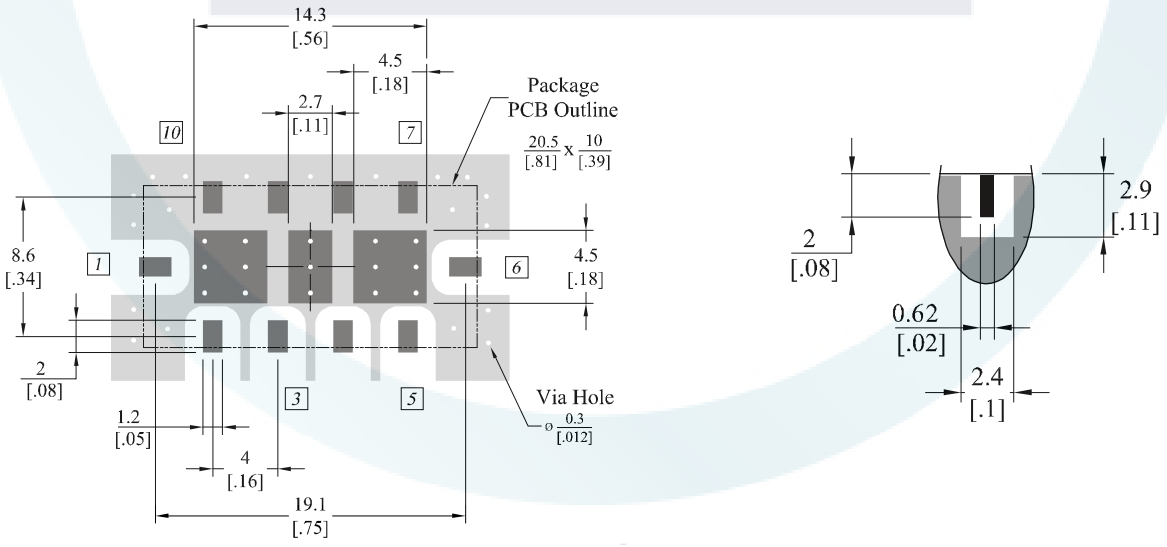


▲ Top & Side View ▲ Bottom View

Pin Description					
Pin No	**Function**	**Pin No**	**Function**	**Pin No**	**Function**
1	Input	5	Vds2	9	GND
2	Vds1	6	Output	10	GND
3	Floating	7	GND	-	-
4	-Vgs2	8	GND	-	-

Recommended Pattern

Detail 'A'



*** Mounting Configuration Notes**

1. For the proper performance of the device, Ground / Thermal via holes must be designed to remove heat.
2. To properly use heatsink, ensure the ground/thermal via hole region to contact the heatsink. We recommend the mounting screws be added near the heatsink to mount the board
3. In designing the necessary RF trace, width will depend upon the PCB material and construction.
4. Use 1 oz. Copper minimum thickness for the heatsink.
5. Do not put solder mask on the backside of the PCB in the region where the board contacts the heatsink
6. We recommend adding as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.

Precautions

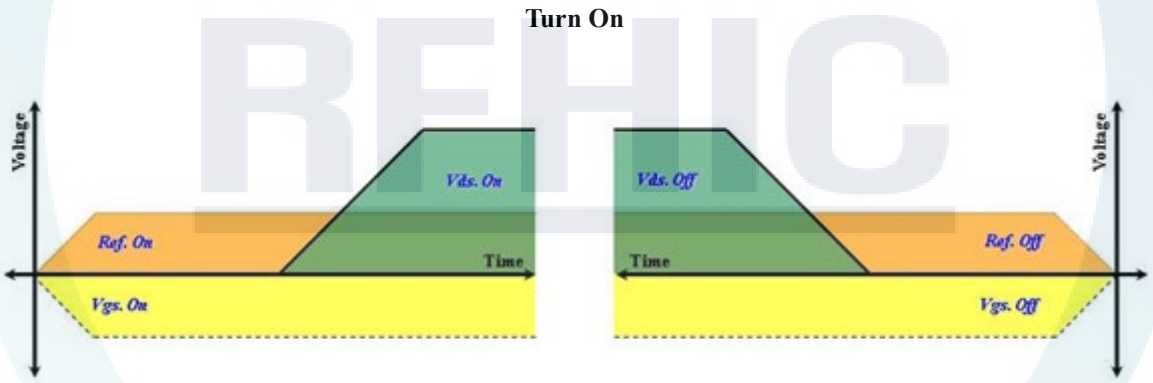
This product is a Gallium Nitride Transistor.
The Gallium Nitride Transistor requires a Negative Voltage Bias which operates alongside a Positive Voltage Bias. These Biases are applied in accordance to the Sequence during Turn-On and Turn-Off.
The Pallet Amplifier does not have a built-in Bias Sequence Circuit. Therefore, users need to either apply positive voltages and negative voltages in the required sequence, or add an external Bias Circuit to this Amplifier.
The required sequence for power supply is as follows.

During Turn-On

1. Connect GND.
2. Apply Vgs2.
3. Apply Vds1 and Vds2.
4. Apply the RF Power.

During Turn-Off

1. Turn off RF power.
2. Turn off Vds1 and Vds2, and then, turn off the Vgs2.
3. Remove all connections.



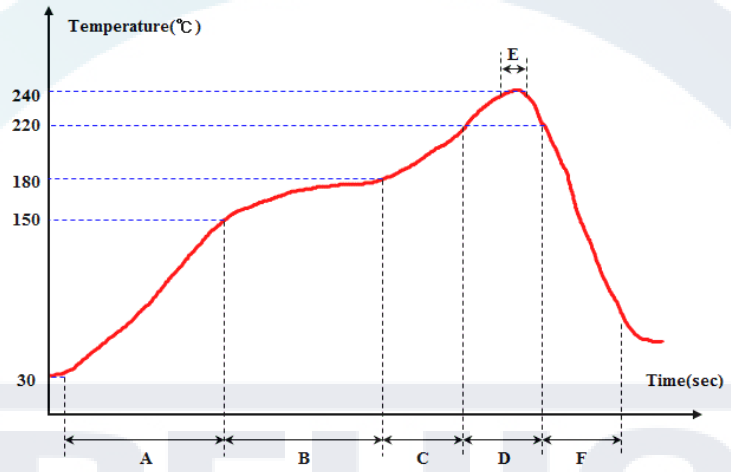
- Sequence Timing Diagram -

Reflow Profile

*** Reflow oven settings**

Zone	A	B	C	D	E	F
Temperature(°C)	30 ~ 150 ℃	150 ~ 180 ℃	180 ~ 220 ℃	220 ~ 220 ℃	235 ~ 240 ℃	2 ~ 6 ℃/ Sec Drop
Belt speed	55 ~ 115 sec	55 ~ 75 sec	30 ~ 50 sec	30 ~ 50 sec	5 ~ 10 sec	60 ~ 90 sec

*** Measured reflow profile**



Ordering Information

Part Number	Package Design
HM0225-05B	-R (Reel)
	-B (Bulk)
	-EVB (Evaluation Board)

Revision History

Part Number	Release Date	Version	Modification	Data Sheet Status
HM0225-05B	2016.09.01	1.0	Package Dimensions	-
HM0225-05B	2016.03.22	0.2	Power Gain Conditions	Preliminary
HM0225-05B	2015.10.02	0.1	Released	Preliminary