



Product Features

- GaN on SiC HEMT
- In/Out Impedance Matching
- Surface Mount Hybrid Type
- Small Size & Weight
- High Efficiency
- Low Cost
- Custom design available

Applications

- Radio System
- Medical Device



Package Type : NP-1A

Description

HM0220-05A have a high performance from 200 ~ 2000MHz. It has developed for Radio and TRS applications. Using metal-Lid and AlN-board, it's effective for thermal problems. This HM0220-05A is designed using Pout of 5W under Pin of 4dBm.

Electrical Specifications @ $V_{ds1}=8V$, $V_{ds2}=24V$, $V_{gs2}@Idq2$, $T_a=25^{\circ}C$

PARAMETER	UNIT	MIN	TYP	MAX	CONDITION
Frequency Range	MHz	200	-	2000	$Z_S = Z_L = 50 \text{ ohm}$
Pout	dBm	-	37	-	Amp : $Idq1 = 120mA$ $Idq2 = 250mA$ Output Power= +37dBm
Power Gain	dB	31	35	-	
Input Return Loss		-5	-10	-	
PAE	%	30	40	-	
Ids	mA	-	-	700	
IMD	dBc	-21	-25	-	Pout=31dBm (each tone) Two-tone space=1MHz
Rising Time of Pout > 90% Falling Time of Pout < 90%	μsec	-	10	-	Lead and Trail Edge of Drive Bias(+8V) = 10 μsec
Supply Voltage	V	-	8	-	Vds1
		-	$V_{gs2}@Idq2$	-	Vgs2
		-	24	-	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

Mechanical Specifications

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

Absolute Maximum Ratings

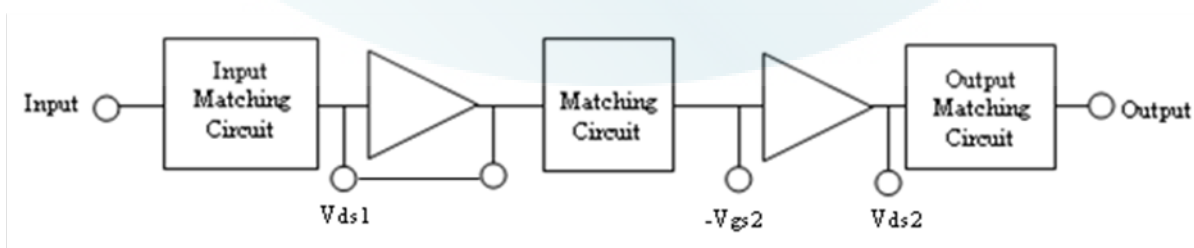
PARAMETER	UNIT	RATING	SYMBOL
Gate-Source Voltage	V	-10 ~ 0	V _{gs2}
Drain-Source Voltage	V	50	V _{ds2}
Gate Current	mA	4	I _{g2}
Operating Junction Temperature	°C	225	T _J
Operating Case Temperature	°C	-40 ~ 85	T _C
Storage Temperature	°C	-55 ~ 100	T _{STG}
Stability into mismatch	-	Stable into VSWR ≤ 10:1 (from 100kHz to 8.5GHz at all phase angles at Pin=-30dBm ~ +7dBm and V _{ds1} = 8V and V _{ds2} =12~24V)	-

Operating Voltages

PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain Voltage 1	V	-	8	10	V _{ds1}
Drain Voltage 2	V	-	24	28	V _{ds2}
Gate Voltage 2 (on-state)	V	-	V _{gs2@Idq2}	-1.5	V _{gs2}
** Gate Voltage 2 (off-state)	V	-	-5	-	V _{gs2}

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

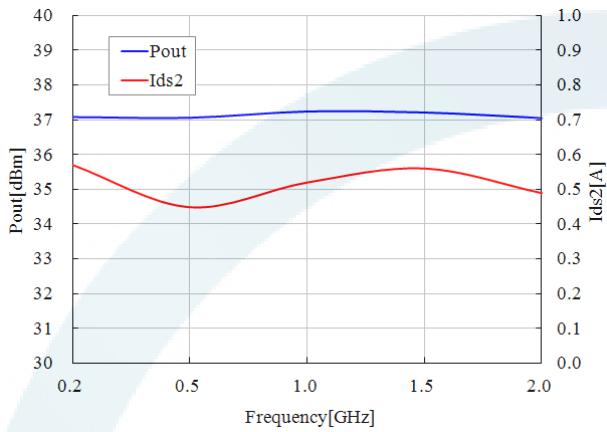
Block Diagram



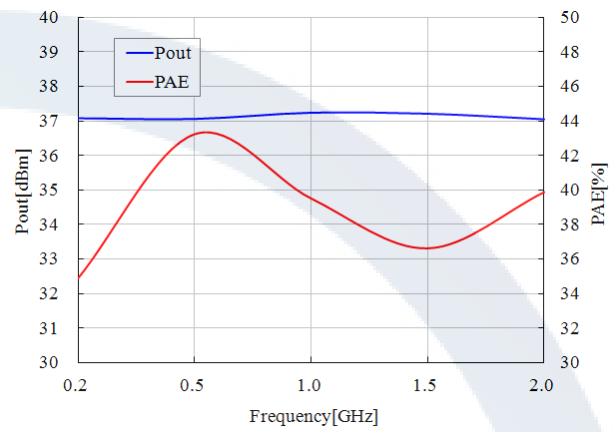
Performance Charts

* Bias condition @ $I_{dq1}=120\text{mA}$, $V_{ds1}=8\text{V}$, $I_{dq2}=250\text{mA}$, $V_{gs2}@I_{dq2}$, $V_{ds2}=+24\text{V}$, $T_a=25^\circ\text{C}$

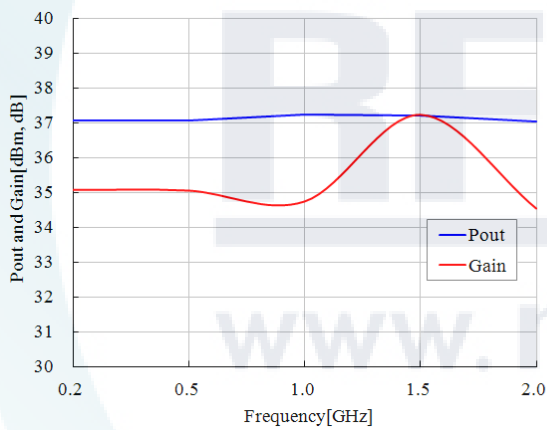
Ids2 @ Pout>37dBm vs. Frequency



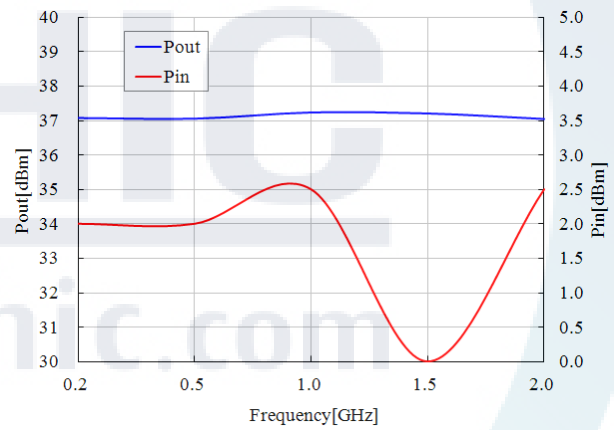
Total PAE @ Pout>37dBm vs. Frequency



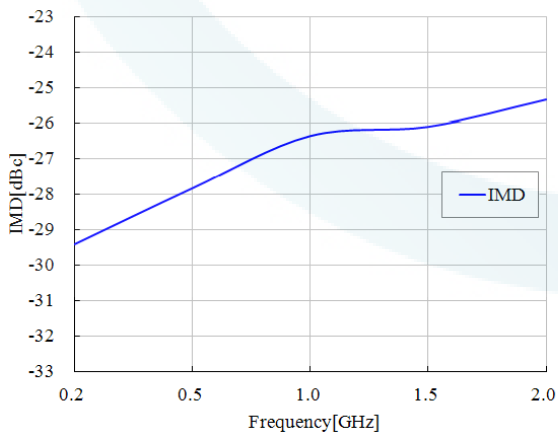
Power Gain @ Pout>37dBm vs. Frequency



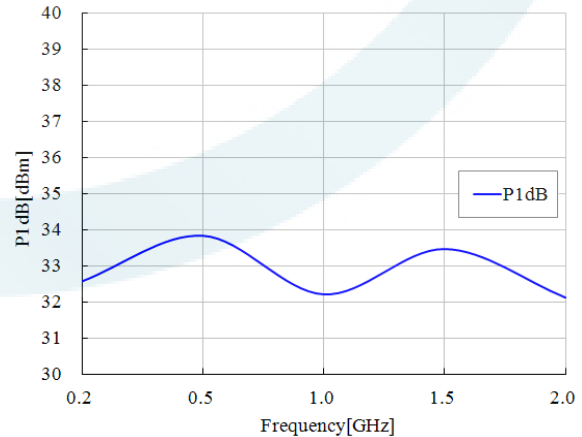
Input Power @ Pout>37dBm vs. Frequency



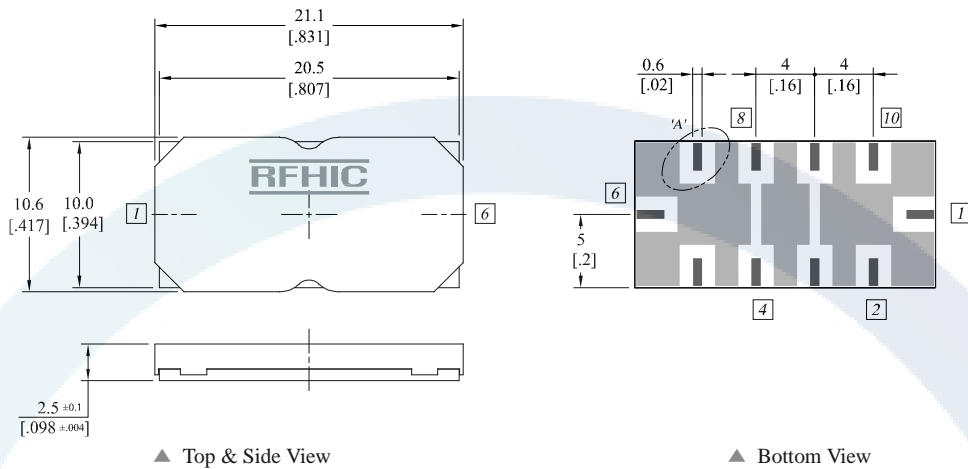
IMD vs. Frequency (each-tone of 31dBm and two-tone space of 1MHz)



P1dB vs. Frequency

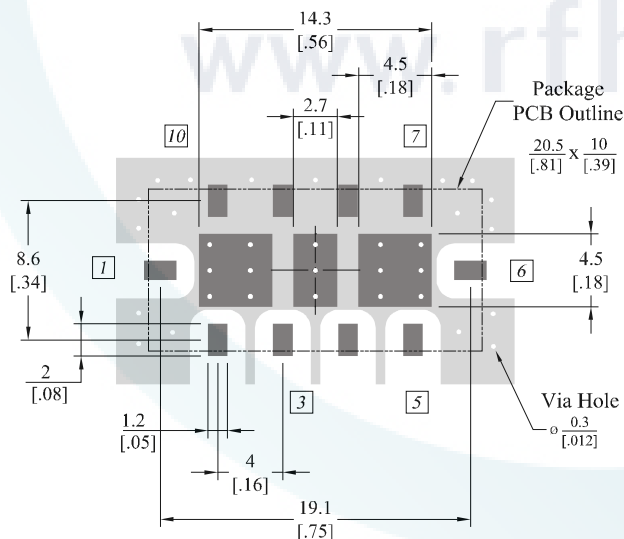


Package Dimensions (Type: NP-1A)

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

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



* Mounting Configuration Notes

- For the proper performance of the device, Ground / Thermal via holes must be designed to remove heat.
- 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
- In designing the necessary RF trace, width will depend upon the PCB material and construction.
- Use 1 oz. Copper minimum thickness for the heatsink.
- Do not put solder mask on the backside of the PCB in the region where the board contacts the heatsink
- 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.

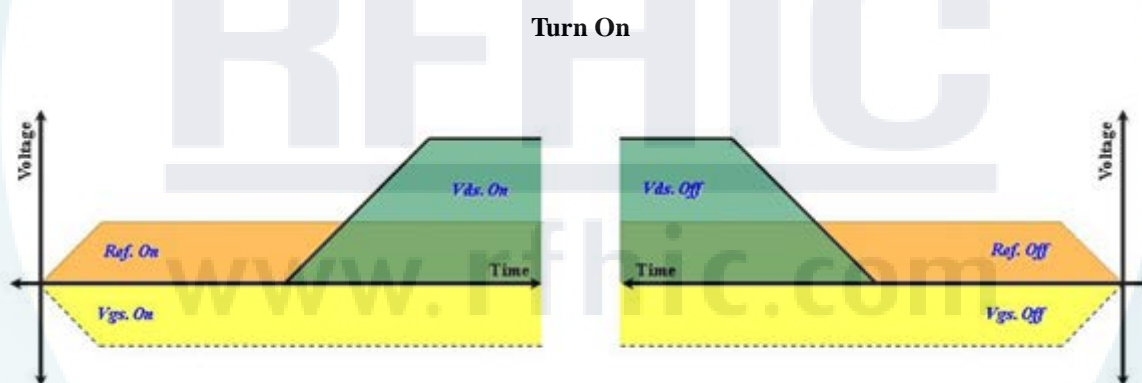
The required sequence for power supply is as follows.

During Turn-On

1. Connect GND.
2. Apply V_{gs2} .
3. Apply V_{ds1} and V_{ds2} .
4. Apply the RF Power.

During Turn-Off

1. Turn off RF power.
2. Turn off V_{ds1} and V_{ds2} , and then, turn off the V_{gs2} .
3. Remove all connections.



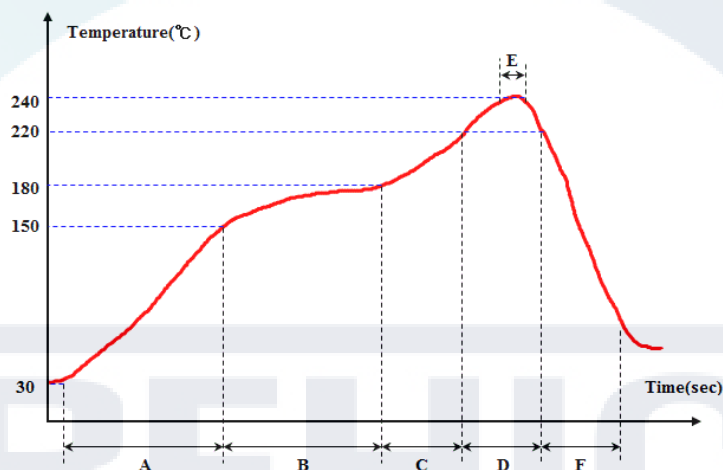
- Sequence Timing Diagram -

Reflow Profile

* Reflow oven settings

Zone	A	B	C	D	E	F
Temperature(°C)	30 ~ 150 °C	150 ~ 180 °C	180 ~ 220 °C	220 ~ 220 °C	235 ~ 240 °C	2 ~ 6 °C/ 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
HM0220-05A	-R (Reel)
	-B (Bulk)
	-EVB (Evaluation Board)

Revision History

Part Number	Release Date	Version	Modification	Data Sheet Status
HM0220-05A	2016.04.21	1.7	Ids2 max. range of Electric Specifications	-
HM0220-05A	2014.01.20	1.6	Vgs(on-stage) of 'Operating Voltages' is changed to '-1.5V'.	-
HM0220-05A	2013.11.01	1.5	Storage temperature is changed to '-55°C' and 'Stability into mismatch' is added to 'Absolute Maximum Ratings'.	-

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