Preliminary

GaN Hybrid Power Amplifier HR5459-25C

Product Features

- GaN on SiC HEMT
- Surface Mount Hybrid Type
- Compact Size & Mass
- High Efficiency
- Low Cost
- Custom design available

Applications

- Radar Systems
- Pulse amplifier application

Package Type : NP-36

Description

The HR5459-25C is designed for Radar system application frequencies from 5.4GHz to 5.9GHz and GaN HEMT technology has been used that performs high breakdown voltage, wide bandwidth and high efficiency. HR5459-25C has been designed 2 stages to have higher Gain at the wide frequency range of 5.4GHz ~5.9GHz. GaN HEMT technology has been used to every amplifier in it for better reliability. Since it is high efficiency amplifier, it can perform at max 10% duty cycle and 50us of pulse width.

Electrical Specifications @ Vds =28V, Ta=25℃

PARAMETER		UNIT	MIN	TYP	MAX	CONDITION
Frequency Range		MHz	5400	-	5900	ZS = ZL = 50 ohm
Power Gain		dB	-	15	-	Amp : Idq1 = 10mA Idq2 = 10mA
Power Flatness			-	-	1	
Input Return Loss			-	-6	-	
Pout @ Psat		W	20	25	-	
Harmonics 1 to N		dBc	-	-25	-	-
Pulse Droop		dB	-	0.5	-	-
Pulse Response	Fall Time	ns	-	-	200	-
	Rise Time	ns	-	-	200	-
Drain Efficiency		%	-	40	-	Pout @ Peak
Ids		A	-	2.3		
Supply Voltage		V	-3.5	-3.3	-3.0	Gate Bias (Vgs1 and Vgs2)
		V	-	28	-	Main Bias(Vds)

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

Test condition = 50us (pulse width), 10%(duty cycle), Pin=29dBm

Note

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

Mechanical Specifications

PARAMETER	UNIT	TYP	REMARK
Mass	g	2	-
Dimension	㎜	20.5 x 12.5 x 4.8	-

Absolute Maximum Ratings

PARAMETER	UNIT	RATING	SYMBOL
Gate-Source Voltage	V	-10 ~ 0	Vgs1 Vgs2
Drain-Source Voltage	V	84	Vds
Gate Current	mA	9.3	Ig
Operating Junction Temperature	℃	225	T_J
Operating Case Temperature	℃	-20 ~ 85	T_C
Storage Temperature	℃	-40 ~ 100	T_{STG}

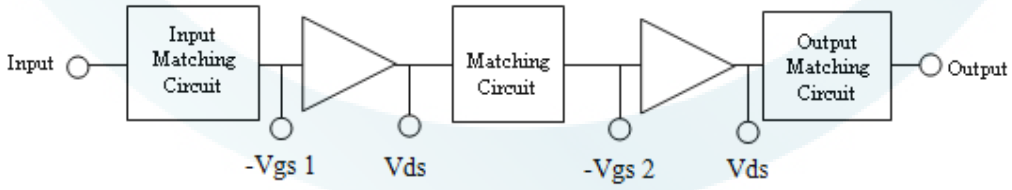
Operating Voltages

PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain Voltage	V	-	28	-	Vds
Gate Voltage (on-stage)	V	-	Vgs1@Idq1	-2	Vgs 1
Gate Voltage (on-stage)	V	-	Vgs2@Idq2	-2	Vgs 2
Gate Voltage (off-stage)	V	-	-8	-	Vgs 1
Gate Voltage (off-stage)	V	-	-8	-	Vgs 2

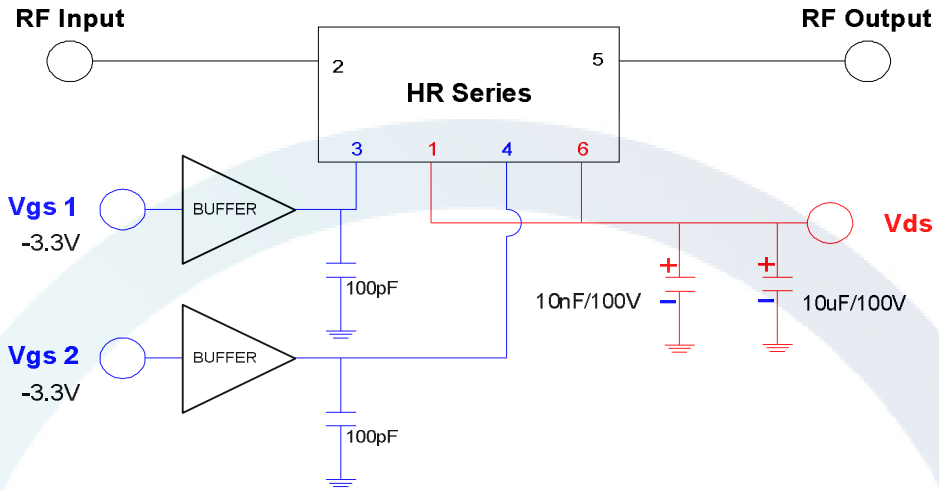
Power Supply

PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain-Source current	A	-	-	3.5	Ids
Gate-Source Current (on-stage)	mA	-	-	20	Igs
Gate-Source Current (off-stage)	mA	-	-	0.04	Igs

Block Diagram

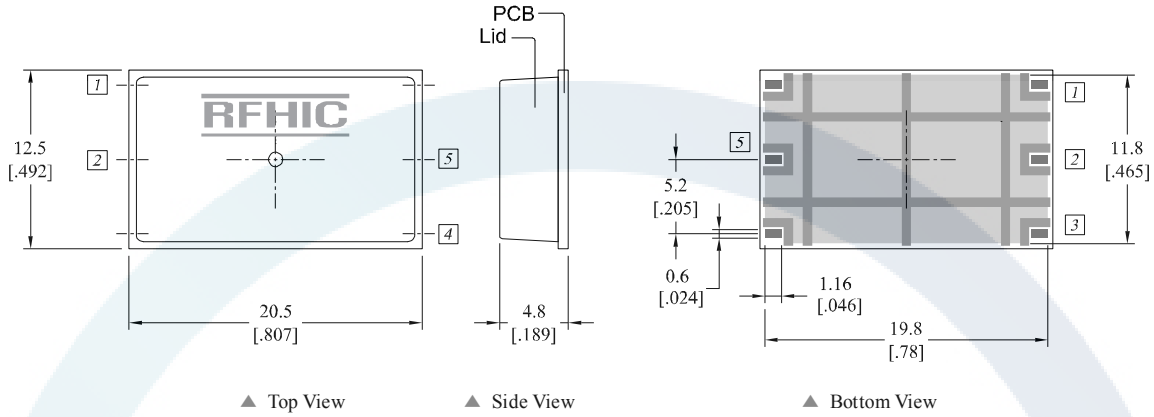


Application Circuit



Package Dimensions (Type: NP-36)

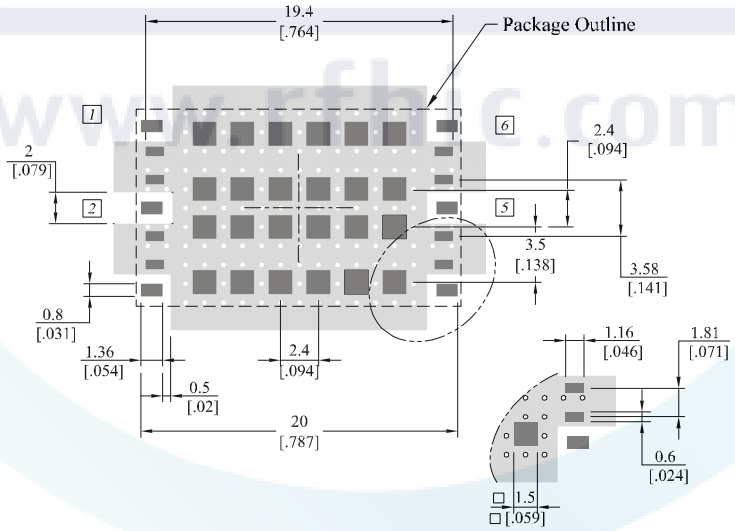
* Unit: mm[inch] | Tolerance: ±0.15[.006]



▲ Top View ▲ Side View ▲ Bottom View

Pin No	Function	Pin No	Function
1	Vds1	6	Vds2
2	RF input	5	RF output
3	Vgs1	4	Vgs2

Recommended Pattern



*** 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

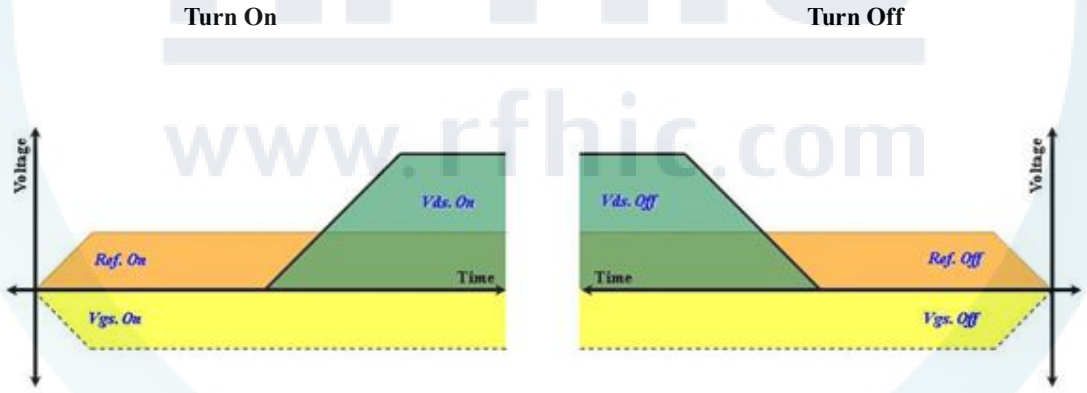
This product is a Gallium Nitride Transistor.
The Gallium Nitride Transistor requires a Negative Voltage Bias which operates alongside a Positive Voltage Bias. These Biases are applied in accordance to the Sequence during Turn-On and Turn-Off.
The Pallet Amplifier does not have a built-in Bias Sequence 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 Vgs1 and Vgs2.
3. Apply Vds.
4. Apply the RF Power.

During Turn-Off

1. Turn off RF power.
2. Turn off Vds, and then, turn off the Vgs1 and Vgs2.
3. Remove all connections.



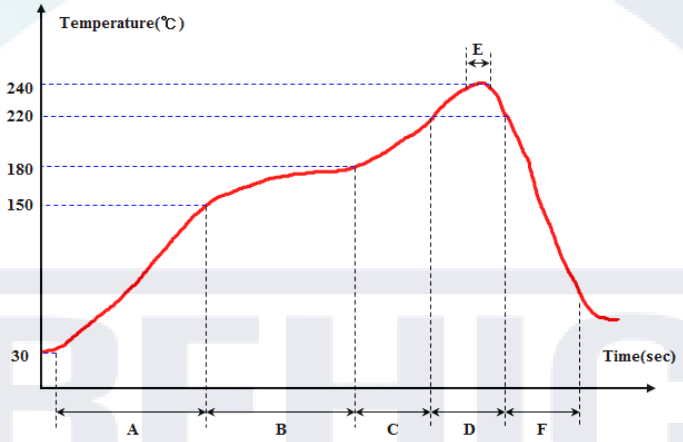
- Sequence Timing Diagram -

Reflow Profile

*** Reflow oven settings**

Zone	A	B	C	D	E	F
Temperature(℃)	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
HR5459-25C	-R (Reel)
	-B (Bulk)
	-EVB (Evaluation Board)

Revision History

Part Number	Release Date	Version	Modification	Data Sheet Status
HR5459-25C	2014.09.03	0.2	Changed Specification	Preliminary
HR5459-25C	2013.07.10	0.1	The first written document	Preliminary