Preliminary

GaN Hybrid Power Amplifier HR2933-70A

Product Features

- Frequency from 2.9 ~ 3.3GHz
- High output power : 48.5dBm(Typ)
- High gain : 23.5dB(Typ)
- High efficiency
- High thermal stability
- Internally matched for ease of use
- 10% Duty Cycle, 500us Pulse Width
- Small Size & Light Weight
- Surface mount Hybrid type

Applications

- Radar System

Package Type : NP-1E

Description

The HR2933-70A is designed for Radar system application frequencies from 2.9 ~ 3.3GHz and GaN HEMT technology has been used that performs high breakdown voltage, wide bandwidth and high efficiency. HR2933-70A has been designed 2 stages to have higher Gain at the wide frequency range of 2.9 ~3.3GHz. 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 500us of pulse width. A droop feature is below 1dB for long pulse usages.

Electrical Specifications @ Vds=50V, Ta=25°C, 50Ω System

PARAMETER	UNIT	MIN	TYP	MAX	CONDITION
Operating Frequency	MHz	2900	3100	3300	
Operating Bandwidth	MHz	-	400	-	
Output Pulse Power	W	60	70	-	
Input Pulse Power	dBm	-	25	-	
Power Gain	dB	-	23.5	-	
Gain Flatness	dB	-	-	-	
Duty Cycle	%	-	5	10	
Pulse Width	us	-	100	500	Idq1 = 100~150 mA Idq2 = 100~150 mA
Drain Efficiency	%	45	50	-	
Amplitude Pulse Droop	dB	-0.5	0.5	1	
Harmonics 1 to N	dBc	-	-20	-	
Spurious Level	dBc	-	-	-60	
Rise Time	ns	-	-	200	
Fall Time	ns	-	-	200	
Phase Deviation	°	-20	-	20	

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

* Test Pulse conditions = 100us, 10%
* Above electrical specifications is measured by connecting electrolytic condenser 200uF to DC. Please make sure that electrolytic condenser is connected properly while testing the module.

Mechanical Specifications

PARAMETER	UNIT	TYP	REMARK
Mass	g	2	-
Dimension	mm	20.5 x 15 x 4.8	-

Absolute Maximum Ratings

PARAMETER	UNIT	RATING	SYMBOL
Gate-Source Voltage	V	-10 ~ 0	Vgs1 Vgs2
Drain-Source Voltage	V	100	Vds
Gate Current	mA	50	Ig
Operating Junction Temperature	℃	225	T_J
Operating Case Temperature	℃	-30 ~ 80	T_C
Storage Temperature	℃	-55 ~ 150	T_{STG}

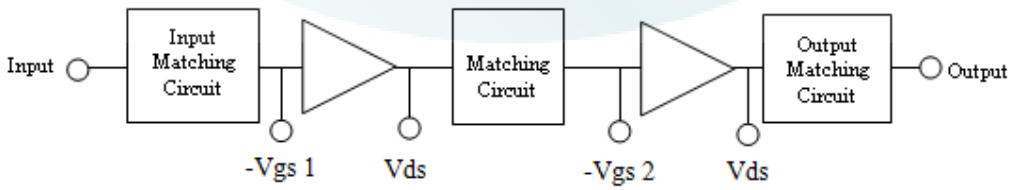
Operating Voltages

PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain Voltage	V	49	50	51	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

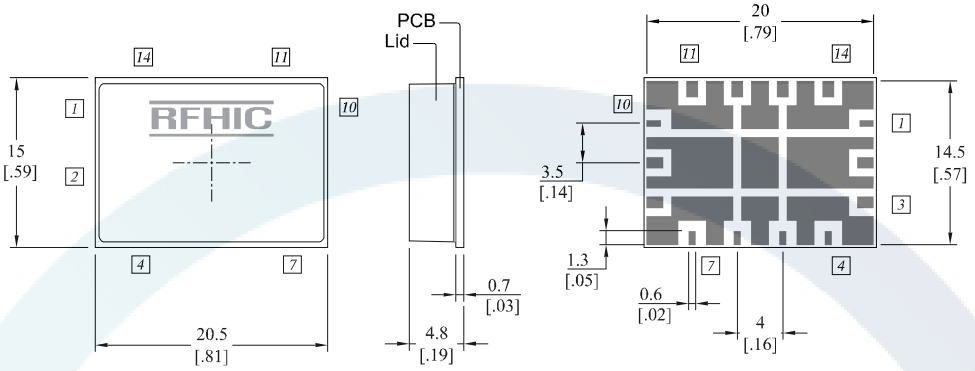
PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain-Source current	A	-	-	3	Ids
Gate-Source Current (on-stage)	A	-	-	0.02	Igs
Gate-Source Current (off-stage)	mA	-	-	0.04	Igs

Block Diagram



Package Dimensions (Type: NP-1E)

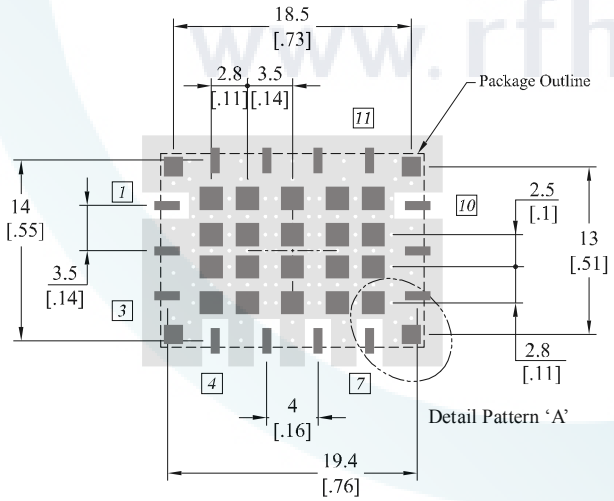
* Unit: mm[inch] | Tolerance: ±0.15[.006]



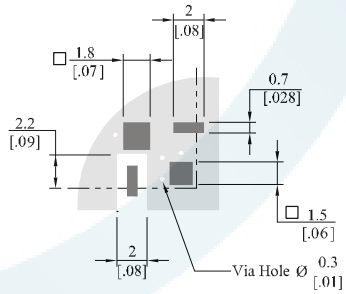
▲ Top View ▲ Side View ▲ Bottom View

Pin Description							
Pin No	**Function**	**Pin No**	**Function**	**Pin No**	**Function**	**Pin No**	**Function**
1	RF Input	4	Vgs1	8	GND	11	GND
2	GND	5	Vds1	9	GND	12	GND
3	GND	6	Vgs2	10	RF Output	13	GND
-	-	7	Vds2	-	-	14	GND

Recommended Pattern



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

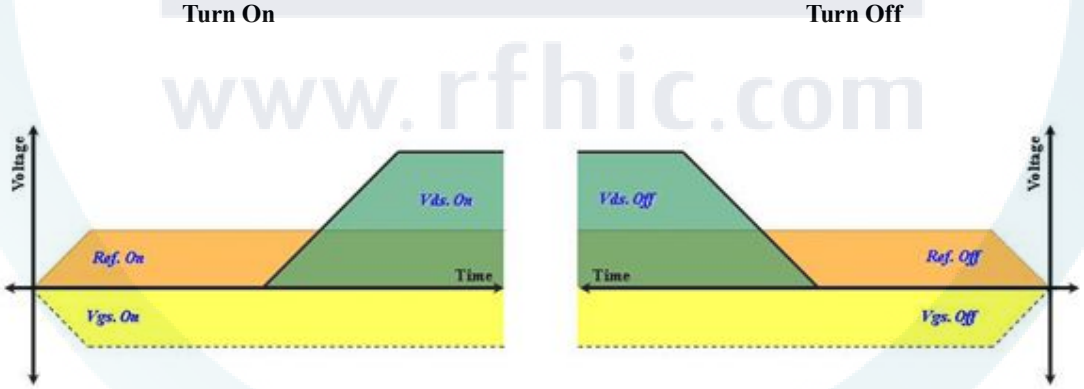
This product is a Gallium Nitride Transistor.
The Gallium Nitride Transistor requires a Negative Voltage Bias which operates alongside a Positive Voltage Bias. These Biases are applied in accordance to the Sequence during Turn-On and Turn-Off.
The Pallet Amplifier does not have a built-in Bias Sequence 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 Vgs1 and Vgs2.
3. Apply Vds1 and Vds2.
4. Apply the RF Power.

During Turn-Off

1. Turn off RF power.
2. Turn off Vds1,2 and then, turn off the Vgs1 and Vgs2.
3. Remove all connections.



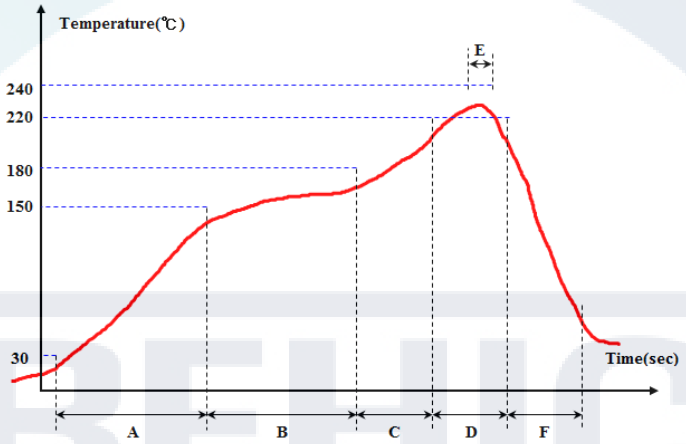
- Sequence Timing Diagram -

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
HR2933-70A	-R (Reel)
	-B (Bulk)
	-EVR (Evaluation Board)

Revision History

Part Number	Release Date	Version	Modification	Data Sheet Status
HR2933-70A	2014.9.10	0.1	New datasheet format.	Preliminary