Preliminary

GaN Hybrid Power Amplifier TG2000-10

RFHIC

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
- TRS(Trunked Radio System)
- RF Sub-Systems
- Base Station

RoHS Comply



Package Type : NP-18

Description

TG2000-10 have a high performance from 100 to 2000MHz. It has developed for Radio and TRS applications. Because using GaN-HEMT and AlN-board, it's effective for thermal problems. This TG2000-10 is designed using Psat of 10W.
And adding 220nH of inductor to Drain Bias Network, this is used at the lower frequency of 20MHz.

Electrical Specifications @ V_{ds}=28V, Vgs@Idq, Ta=25℃

PARAMETER	UNIT	MIN	TYP	MAX	CONDITION
Frequency Range	MHz	200	-	2000	ZS = ZL = 50 ohm
Power Gain @ P1dB	dB	10	12	-	Vds = +28V Vgs@Idq Idq = 20mA
Gain Flatness		-	±1.0	-	
Input Return Loss		-5	-10	-	
P1dB	dBm	37	38	-	
P3dB		-	40	-	
Efficiency @ P3dB	%	30	50	-	
Ids @ P3dB	mA	-	550	-	
Load Mismatch	-	-	5:1	-	All load phase
Supply Voltage	V	-	Vgs@Idq	-	Vgs
		-	28	-	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

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

Mechanical Specifications

PARAMETER	UNIT	TYP	REMARK
Mass	g	1	-
Dimension	mm	15 x 10 x 5.4	Outermost

Absolute Maximum Ratings

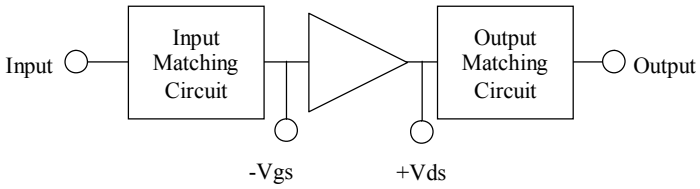
PARAMETER	UNIT	RATING	SYMBOL
Gate-Source Voltage	V	-10 ~ 0	Vgs
Drain-Source Voltage	V	50	Vds
Gate Current	mA	3.6	Ig
Operating Junction Temperature	°C	225	T_J
Operating Case Temperature	°C	-40 ~ 85	T_C
Storage Temperature	°C	-40 ~ 100	T_{STG}

Operating Voltages

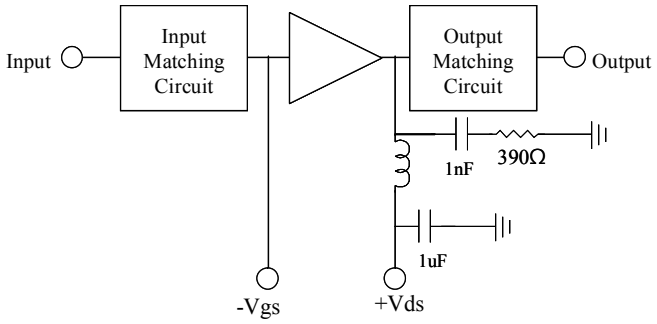
PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain Voltage	V	-	+28	-	Vds
Gate Voltage (on-state)	V	-	Vgs@Idq	-2	Vgs
Gate Voltage (off-state)	V	-	-8	-	Vgs

Block Diagram

200MHz~2000MHz



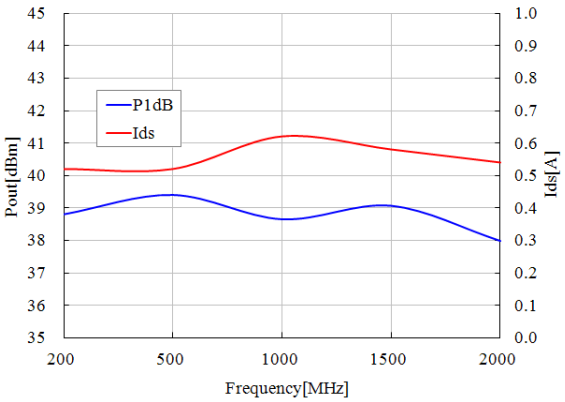
30MHz~2000MHz



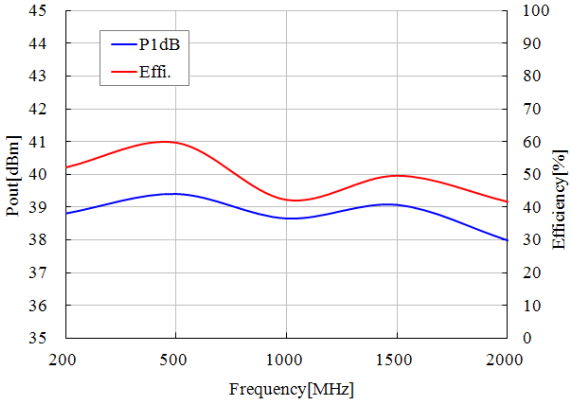
Performance Charts

*** Bias condition** @ Idq=20mA, Vgs@Idq, Vds =+28V, Ta=25℃

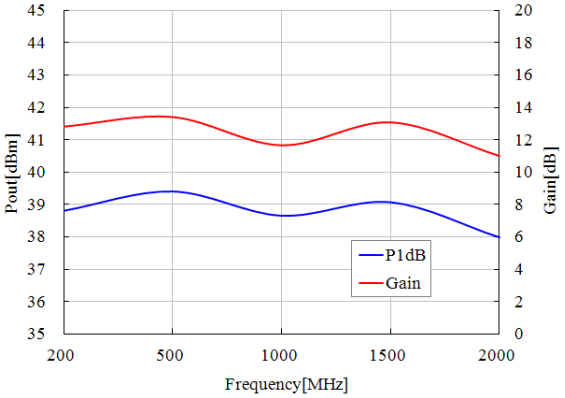
Ids vs. Frequency (@P1dB)



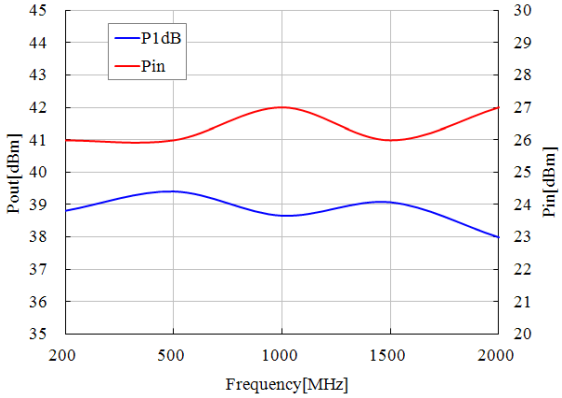
Efficiency vs. Frequency (@P1dB)



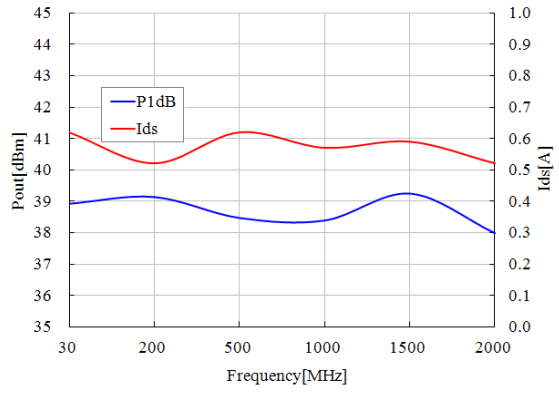
Power Gain vs. Frequency (@P1dB)



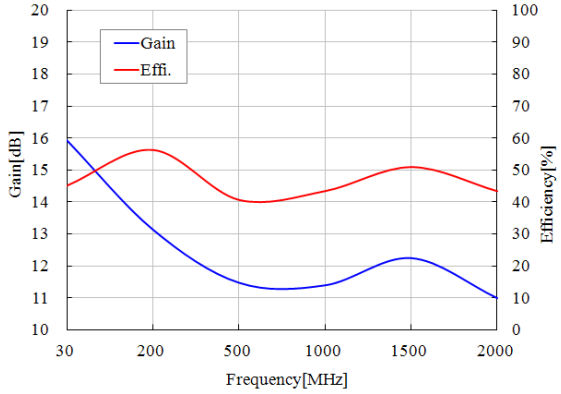
Pin vs. Frequency (@P1dB)



P1dB & Ids vs. Frequency (under 200MHz)

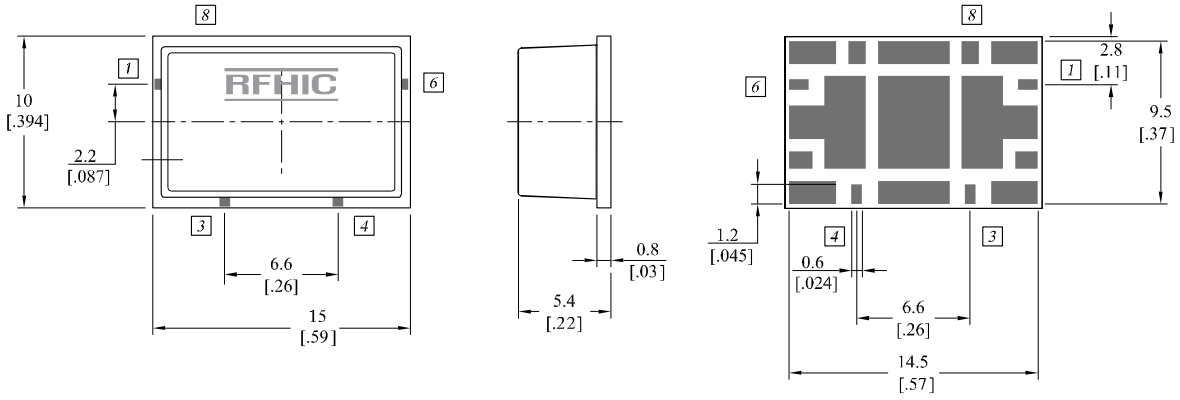


Gain & Efficiency vs. Frequency @P1dB (under 200MHz)



Package Dimensions (Type: NP-18)

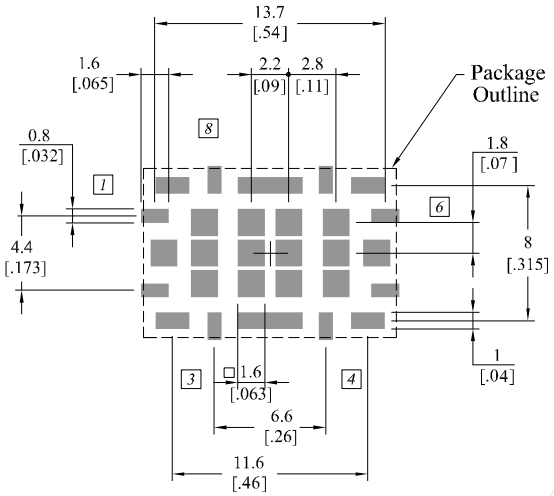
* Unit: mm[inch] | Tolerance: ±0.15[.006]



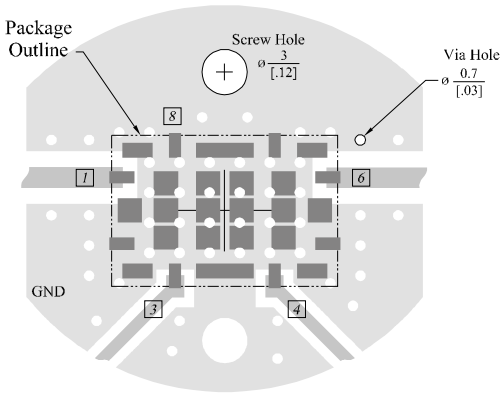
▲ Top View ▲ Side View ▲ Bottom View

Pin Description							
Pin No	**Function**	**Pin No**	**Function**	**Pin No**	**Function**	**Pin No**	**Function**
1	RF Input	3	Gate Bias (-Vgs)	5	GND	7	GND
2	GND	4	Drain Bias (+Vds)	6	RF Output	8	GND

Recommended Pattern



Recommended Mounting Configuration



*** 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.

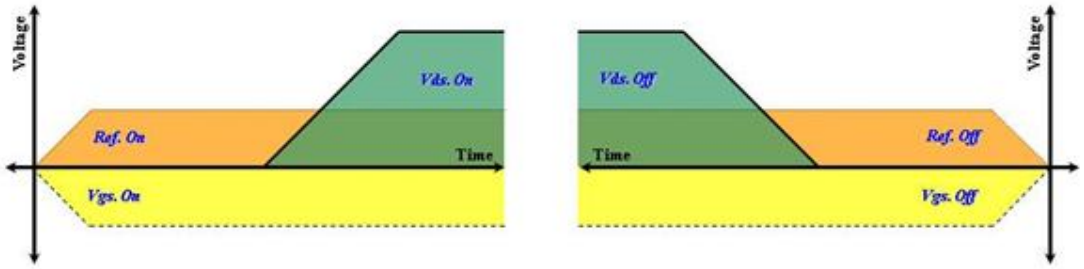
During Turn-On

1. Connect GND.
2. Apply Vgs.
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 Vgs.
3. Remove all connections.

Turn On



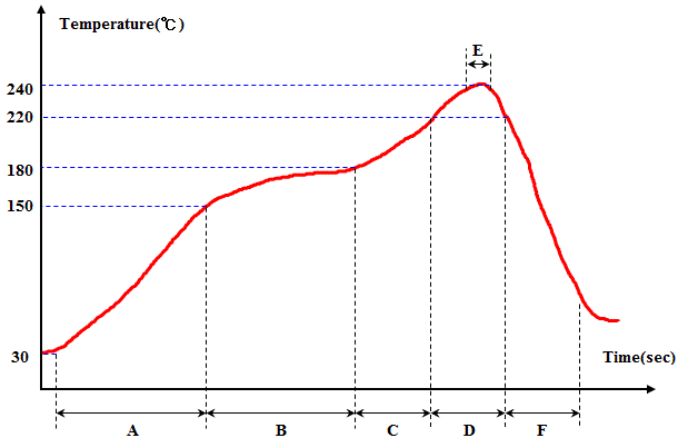
- Sequence Timing Diagram -

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
TG2000-10	-R (Reel)
	-B (Bulk)
	- EVB (Evaluation Board)

Revision History

Part Number	Release Date	Version	Modification	Data Sheet Status
TG2000-10	2014.06.26	0.6	▪ A mass of mechanical specification is changed.	Preliminary
TG2000-10	2012.12.28	0.5	▪ Specifications of Absolute Maximum Ratings and Operating Voltages are changed.	Preliminary
TG2000-10	2012.11.08	0.4	▪ Idq of Test Condition is changed to 20mA. ▪ Solderability Characteristic information is supplemented.	Preliminary

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