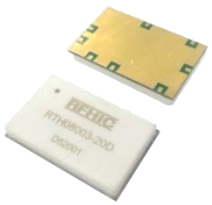
GaN Doherty Hybrid Amplifier RTH08003-20D

Product Features

- GaN on SiC Chip on Board
- Surface Mount Hybrid Type
- 2-Stage Doherty Amplifier
- High Efficiency
- No Matching circuit needed

Applications

- RF Sub-Systems
- Base Station
- RRH
- 4G/ LTE system
- Small cell



Package Type : SP-1E

Description

Accommodating the future of 4G/LTE small cells, RFHIC introduces RTH08003-20D amplifier fabricated using an advanced high power density Gallium Nitride (GaN) semiconductor process.

Electrical Specifications @ Vds1=5V, Vds2=30V, Ta=25℃

PARAMETER	UNIT	MIN	TYP	MAX	CONDITION
Frequency Range	MHz	860	867.5	875	ZS = ZL = 50 ohm
Power Gain	dB	27	30	-	-
Gain Flatness		-1.5	-	+1.5	
Input Return Loss		-	-15	-9	
Pout @ Average	dBm	-	35.5	-	3.548W
Pout @ Saturation	dBm	43	43.5	-	Pulse Width=20us, Duty cycle 10%
ACLR @ BW 10MHz LTE (PAPR 7.5dB)	dBc	-	-28	-25	Non DPD
		-	-53	-	With DPD
Doherty Efficiency	%	-	50	-	Tc=25℃
Total Efficiency		39	43	-	
Drive Amp. Idq	mA	-	180	-	-
Carrier Amp. Idq		-	120	-	Inverted Doherty
Peaking Amp. Idq		-	0	-	
Supply Voltage	V	-4.9	-4.5	-3.0	Vgc
		-4.9	-2.8	-2.0	Vgp
		-	5.0	-	Vds1
		-	30	-	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

1. ACLR Measured Pout=35.5dBm @ fc± 10MHz / 9.015MHz
   LTE 10MHz 1FA PAPR=7.5dB @ 0.01% probability on CCDF

Mechanical Specifications

PARAMETER	UNIT	TYPICAL	RATING
Mass	g	6.0	±1.0
Dimension	㎜	32 x 20 x 4.2	±0.15

Absolute Maximum Ratings

PARAMETER	UNIT	RATING	SYMBOL	CONDITION
Gate-Source Voltage	V	-10 ~ 0	Vgc Vgp	Tc=25°C
Drain-Source Voltage 1	V	7	Vds1	Tc=25°C
Drain-Source Voltage 2	V	50	Vds2	Tc=25°C
Gate Current	mA	4 4	Carrier Peaking	Tc=25°C
Power Dissipation	W	6.1	P_D	Tc=85°C
Operating Junction Temperature	℃	225	T_J	-
Operating Case Temperature	℃	-30 ~ 85	T_C	-
Storage Temperature	℃	-40 ~ 100	T_{STG}	-
Soldering Temperature[*1]	℃	260	Ts	30s Max.
RF Input Level (Pulse)	dBm	30	Pin	Tc=25°C

*1 Reflow cycle limit : 1time

Operating Voltages & Input level

PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain Voltage 1	V	4.75	5	5.25	Vds1
Drain Voltage 2	V	29.5	30	30.5	Vds2
Gate Voltage (on-stage)	V	-4.9	Vgc[*2]	-3.0	Vgc
Gate Voltage (on-stage)	V	-4.9	Vgp[*3]	-2.0	Vgp
Gate Voltage (off-stage)	V	-	-8	-	Vgc
Gate Voltage (off-stage)	V	-	-8	-	Vgp
RF Input Level (Pulse)	dBm	-	-	25	Pin

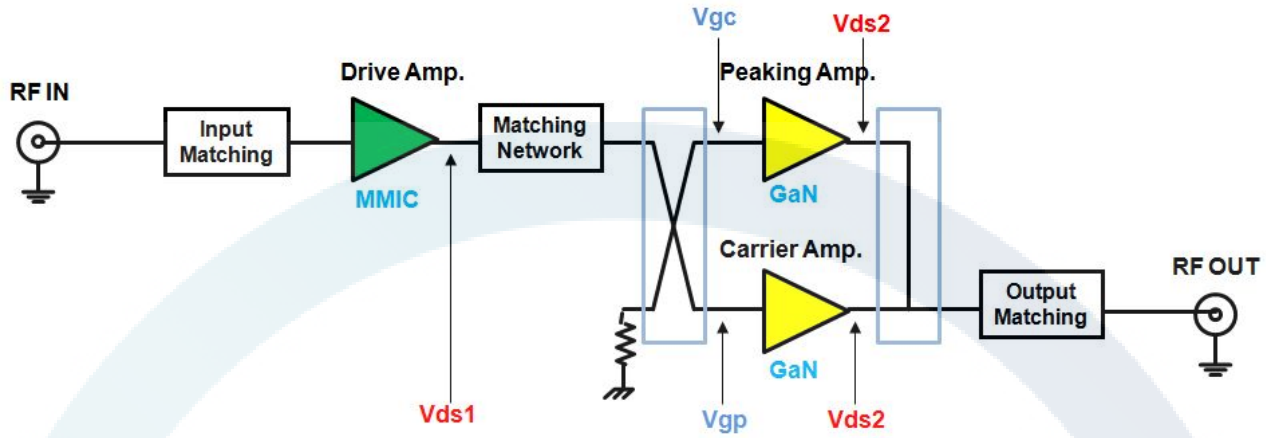
*2 Vgc(Pin#13) set: Lower Vgc of Δ-1.75V at Peaking Idq 100mA±5%

*3 Vgp(Pin#5) set: Carrier Idq 120mA±5%

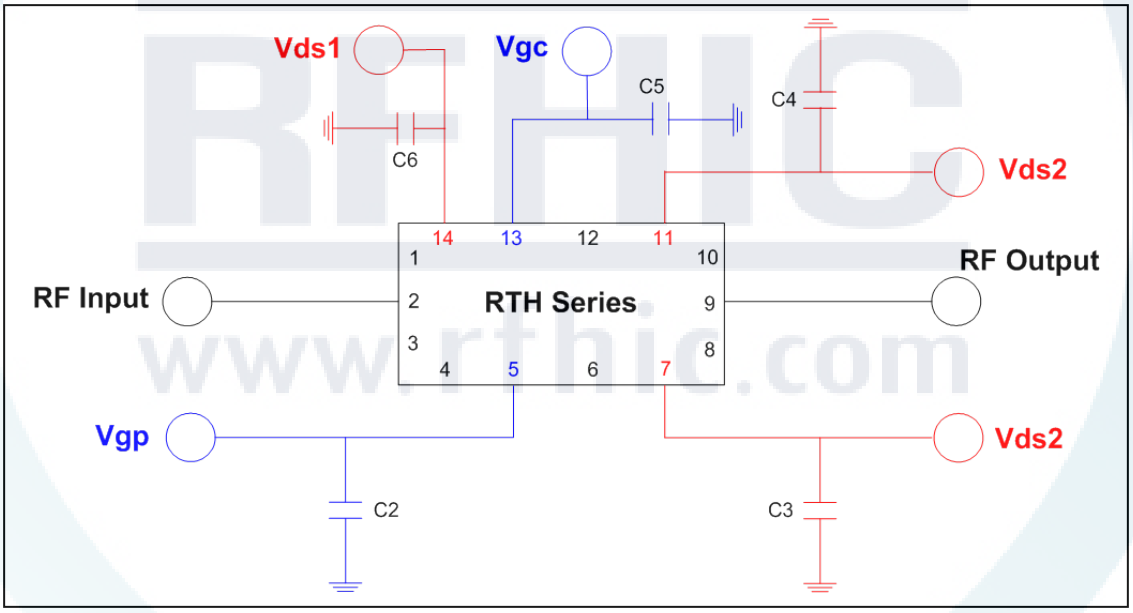
ESD Level

PARAMETER	STANDARD	RESULT
HBM	JESD22-A114E	Class 1B/ passed Voltage 700V
MM	JESD22-A115C	Class A/ passed Voltage 150V

Block Diagram



Application Circuit



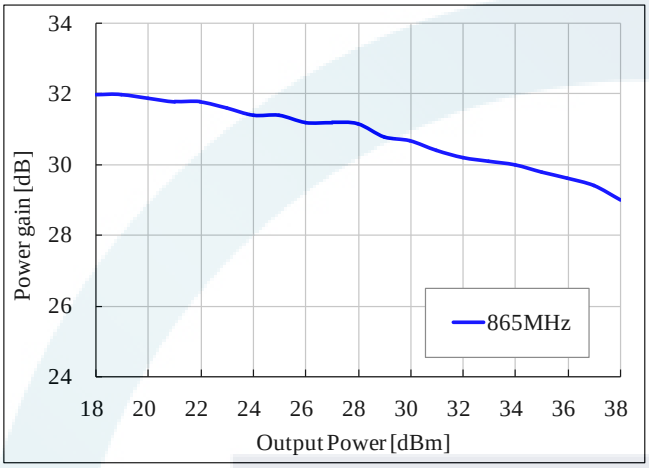
Bill of Material (Evaluation board)

LOCATION	Part Number	Value	Manufacturer
C3, C4, C6	1812B225K101CT	2.2uF / 100V	WALSIN
C2, C5	GRM188R71C105KA12D	1uF / 16V	MURATA
PCB	RO4350B	2Layer, 20mil, 1oz	ROGERS

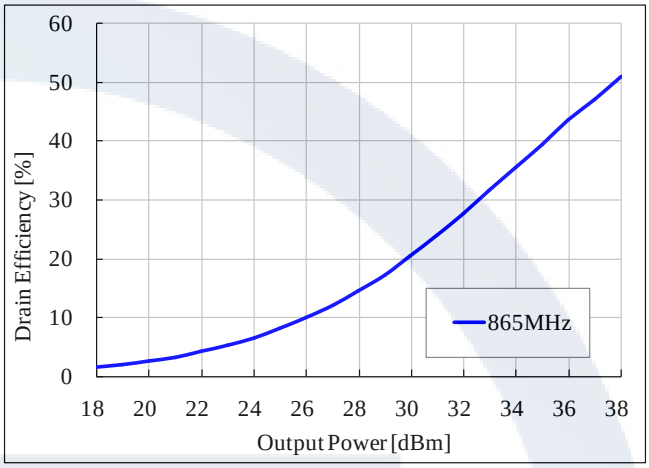
Performance Charts

* **Bias condition** @ Drive Idq=180mA, Carrier Idq=120mA, Peaking Idq=0mA, Ta=25℃

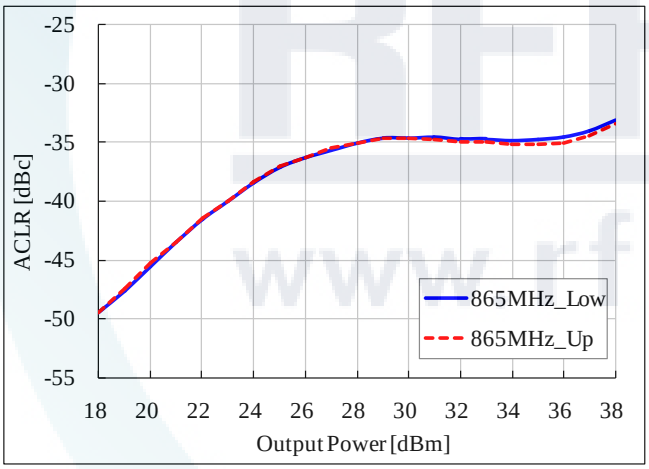
Power Gain vs. Output Power



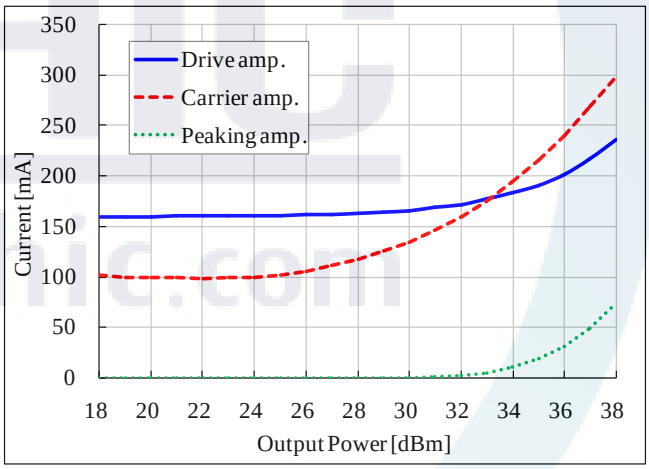
Drain Efficiency vs. Output Power



ACLR vs. Output Power

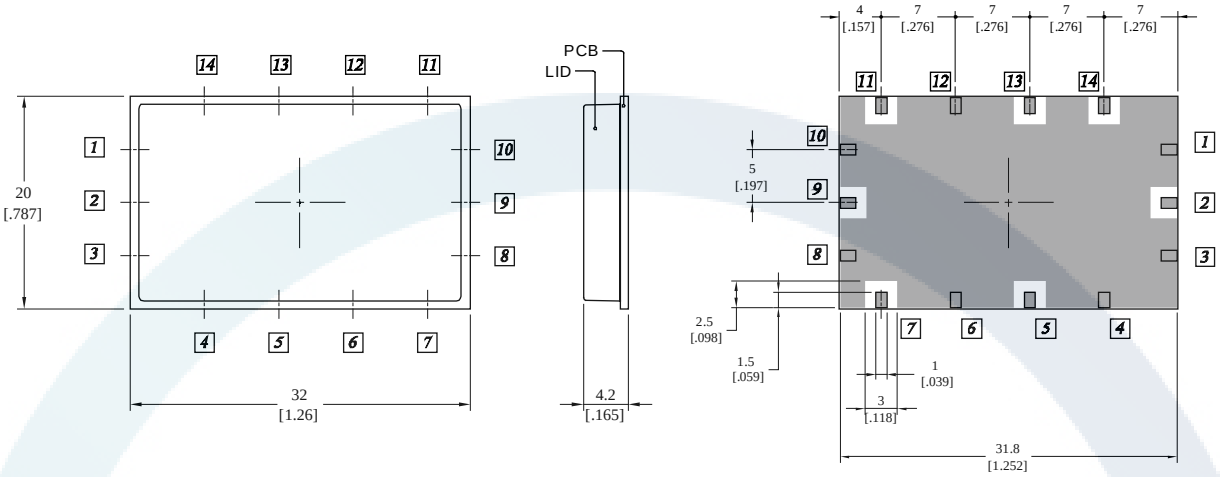


Current vs. Output Power



Package Dimensions (Type: SP-1E)

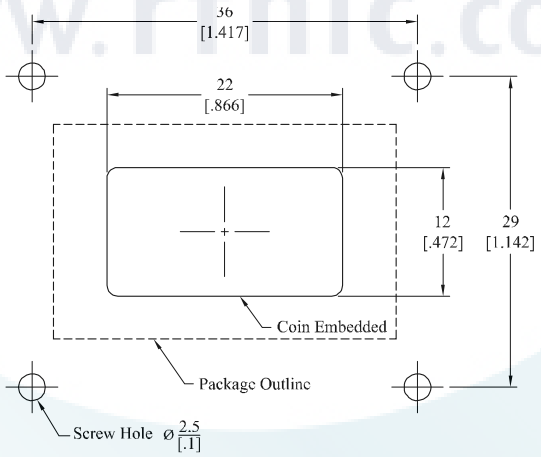
* Unit: mm[inch] | Tolerance: ±0.15[.006]



▲ Top View ▲ Side View ▲ Bottom View

Pin Description (RTH08003-20D)							
Pin No	**Function**	**Pin No**	**Function**	**Pin No**	**Function**	**Pin No**	**Function**
1	GND	4	GND	8	GND	11	Vds2
2	RF In	5	Vgp	9	RF Out	12	GND
3	GND	6	GND	10	GND	13	Vgc
		7	Vds2			14	Vds1

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.
7. We recommend that the PCB with the RF device in a hybrid package(RTH Series) is not washed to remove the flux.

Ordering Information

Part Number	Package Design
RTH08003-20D	-R (Reel)
	-B (Bulk)
	-EVB (Evaluation Board)

Revision History

Part Number	Release Date	Version	Modification	Data Sheet Status
RTH08003-20D	2016.04.20	3.0	Electrical Specification (1p) Performance Charts (3p)	-
RTH08003-20D	2015.06.22	1.3	Electrical Specification	-
RTH08003-20D	2015.06.04	1.2	Absolute Maximum Ratings	-