

Product Features

- E-pHEMT GaAs + GaN on SiC
- 2-Stage Amplifier 50ohms Matching
- Surface Mount Hybrid Type
- Small Size & Mass
- High Efficiency

Applications

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



Package Type : NP-1EL

Description

The HT2121-15M is designed for LTE Repeater & RF Sub-systems application frequencies from 2110 ~ 2170MHz. This amplifier uses GaN HEMT technology which performs high breakdown voltage, high efficiency. High In/Output impedance, High power density.

Electrical Specifications @ $V_{ds1} = 5V$, $V_{ds2} = 28V$, $T_a = 25^\circ C$

PARAMETER	UNIT	MIN	TYP	MAX	CONDITION
Frequency Range	MHz	2110	-	2170	ZS = ZL = 50 ohm
Power Gain	dB	30	32	35	Amp1 : Idq1 = 140mA Amp2 : Idq2 = 105mA
Gain Flatness		-	0.6	-	
Input Return Loss		-	-15	-7.5	
Pout @ Average	dBm	-	33	-	Pulse Width=20us, Duty10%
Pout @ Psat	dBm	40.9	41.7	-	
ACLR @ BW 10MHz LTE (PAPR 7.5dB)	dBc	-	-36	-32	Non DPD
		-	-55	-	With DPD
Drain Efficiency	%	24	26	-	Pout @ Average
Ids1	mA	-	140	-	
Ids2		-	250	-	
Supply Voltage	V	-	5	-	Drive Amp. (V_{ds1})
		-	-3.0	-2.0	Gate Bias (V_{gs2})
		-	28	-	Main Bias (V_{ds2})

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=33dBm @ $f_c \pm 10\text{MHz} / 9.015\text{MHz}$
LTE 10MHz 1FA PAPR=7.5dB @ 0.01% probability on CCDF, (DPD Engine: Optichron OP6180)
2. HT Series have internal DC blocking capacitors at the RF input and output ports

Mechanical Specifications

PARAMETER	UNIT	TYP	REMARK
Mass	g	2	-
Dimension	mm	20.5 x 15 x 3.5	-

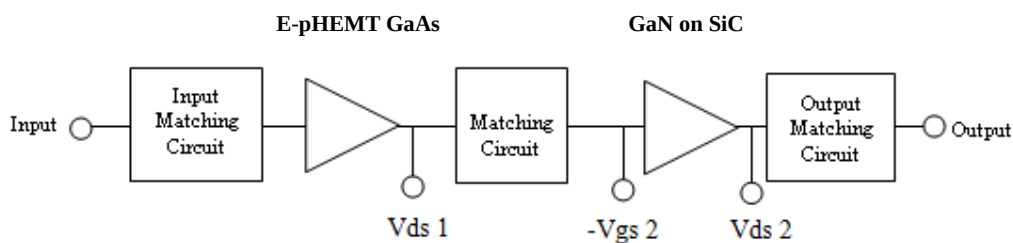
Absolute Maximum Ratings

PARAMETER	UNIT	RATING	SYMBOL
Gate-Source Voltage	V	-10 ~ 0	V _{gs2}
Drain-Source Voltage	V	7	V _{ds1}
		50	V _{ds2}
Gate Current	mA	4.0	I _{gs2}
Operating Junction Temperature	°C	225	T _j
Operating Case Temperature	°C	-30 ~ 85	T _C
Storage Temperature	°C	-40 ~ 100	T _{STG}
Maximum RF Input Level	dBm	20	Pin

Operating Voltage & Input Level

PARAMETER	UNIT	MIN	TYP	MAX	SYMBOL
Drain Voltage	V	4.75	5	5.25	V _{ds1}
		27.5	28	28.5	V _{ds2}
Gate Voltage (on-stage)	V	-	-3	-2	V _{gs2}
Gate Voltage (off-stage)	V	-	-8	-	V _{gs2}
Idq2 (Control Vgs2)	mA	100	105	110	I _{dq2}
RF Input Level	dBm	-	-	15	Pin

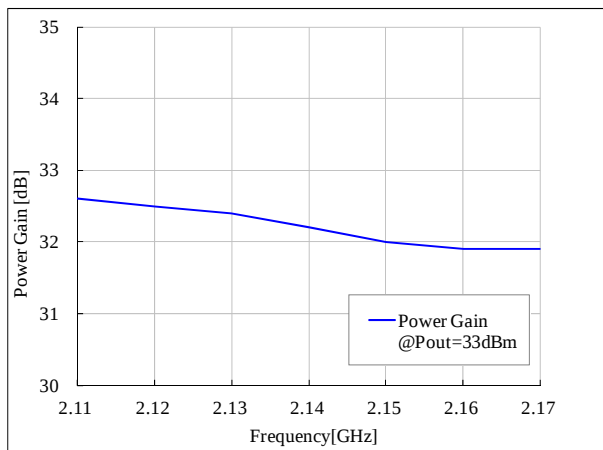
Block Diagram



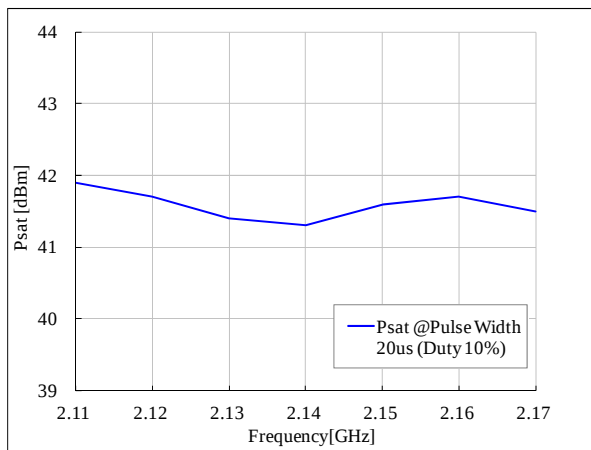
Performance Charts

* Bias condition @ Idq1= 140mA, Idq2= 105mA, Ta=25℃

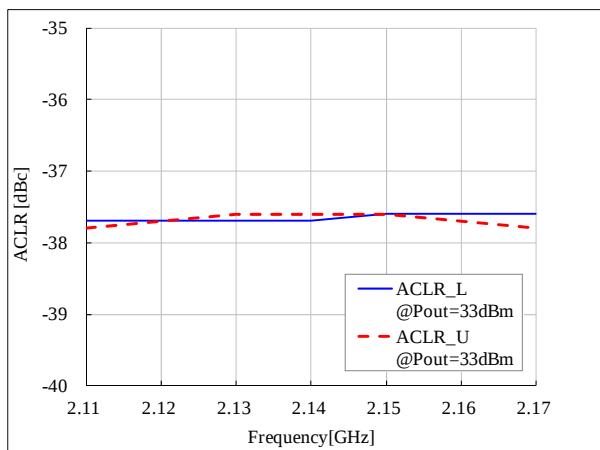
Power Gain vs. Frequency



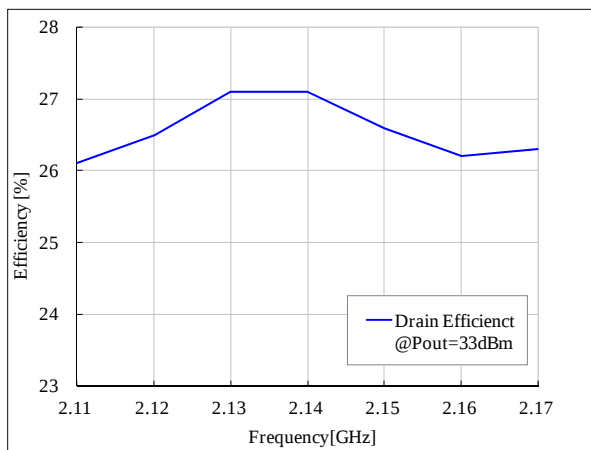
Psat vs. Frequency



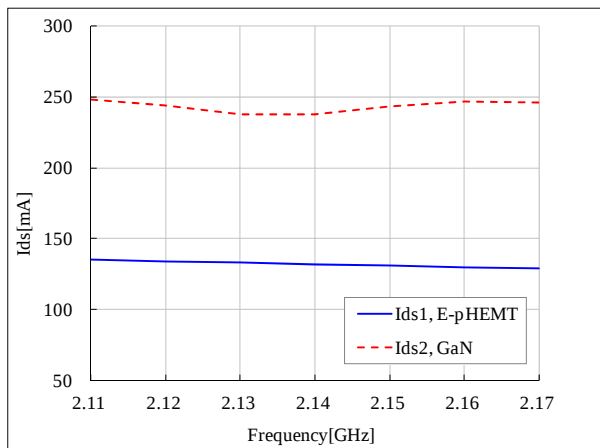
ACLR vs. Frequency



Efficiency vs. Frequency



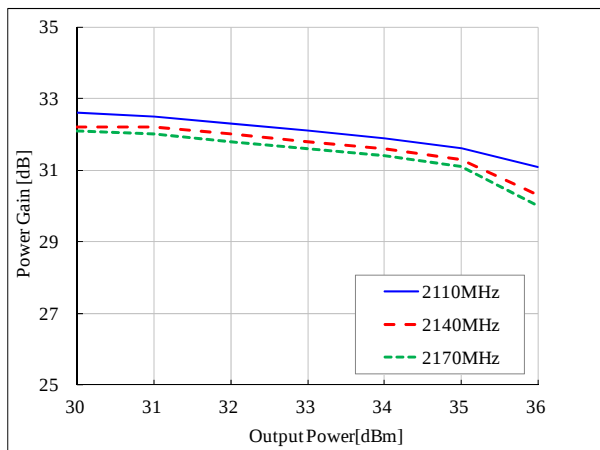
Ids1 vs. Ids2 vs. Frequency



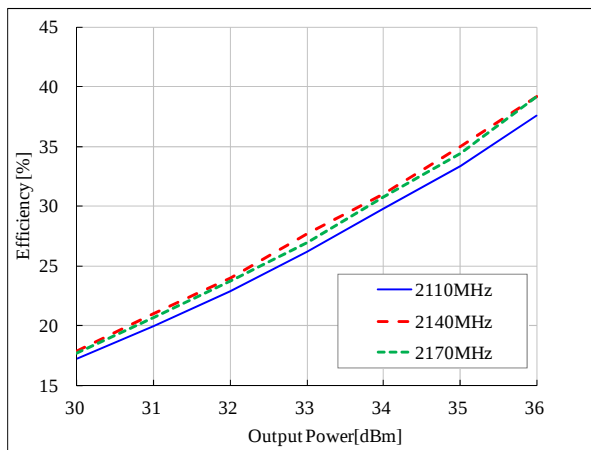
Performance Charts

* Bias condition @ $I_{dq1}=140\text{mA}$, $I_{dq2}=105\text{mA}$, $T_a=25^\circ\text{C}$

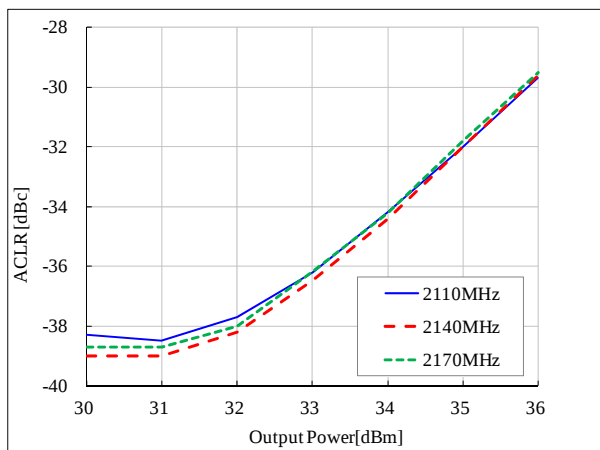
Power Gain vs. Output Power



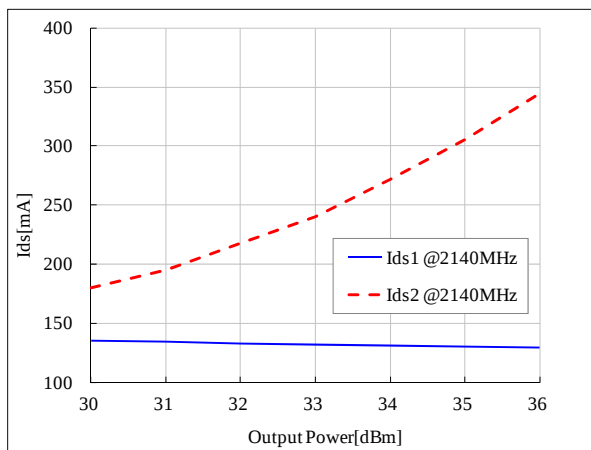
Efficiency vs. Output Power



ACLR vs. Output Power

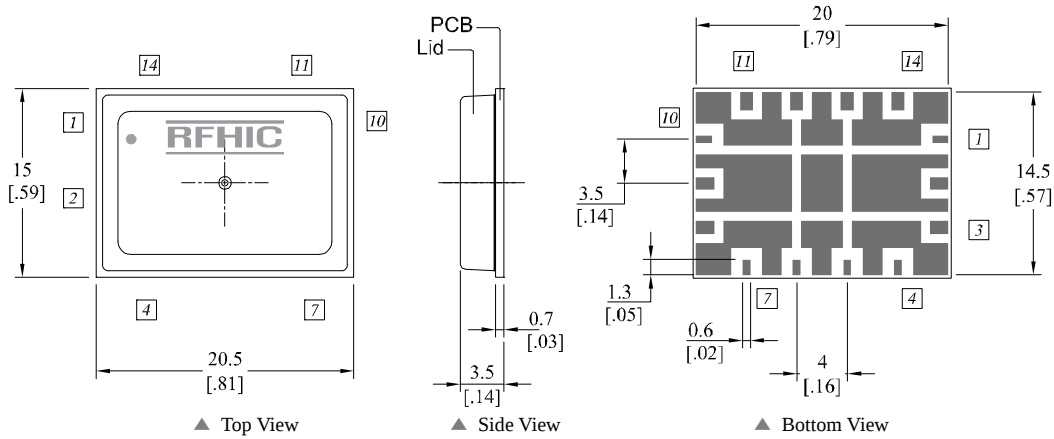


Ids1 vs. Ids2 vs. Output Power



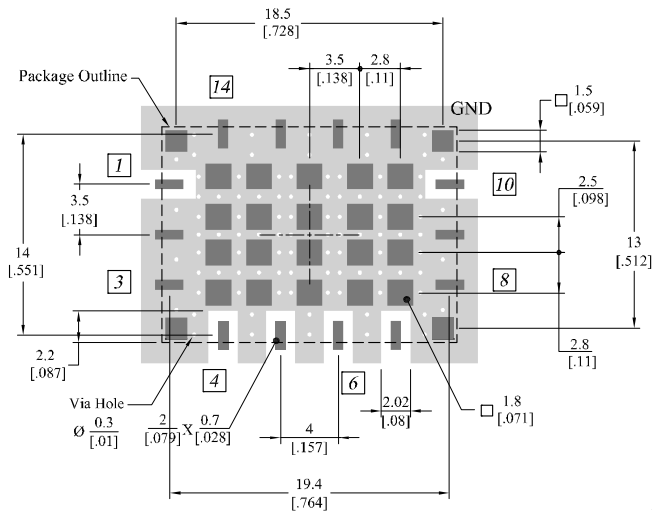
*LTE 10MHz (PAPR=7.5dB) w/o DPD

Package Dimensions (Type: NP-1EL)

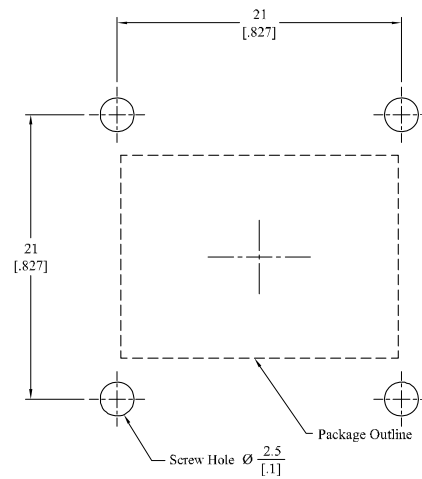
* Unit: mm[inch] | Tolerance: ± 0.15 [.006]

Pin Description							
Pin No	Function	Pin No	Function	Pin No	Function	Pin No	Function
1	RF Input	4	N.C	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 Mounting Configuration



* 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.

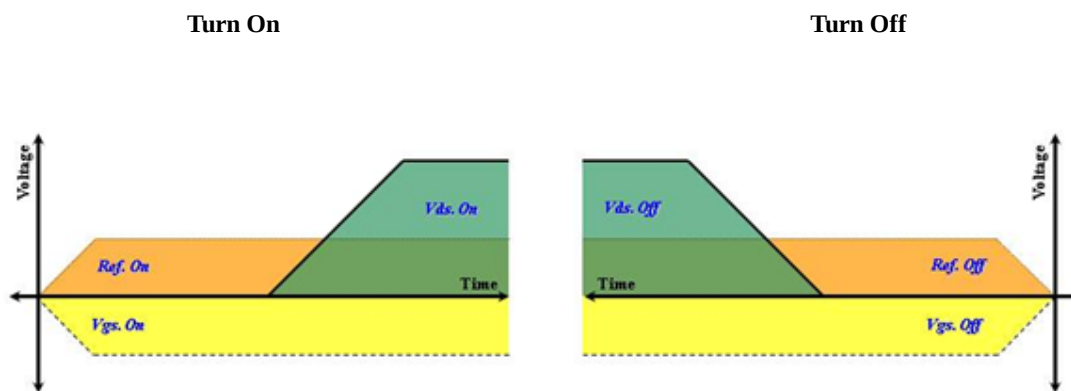
The required sequence for power supply is as follows.

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 -

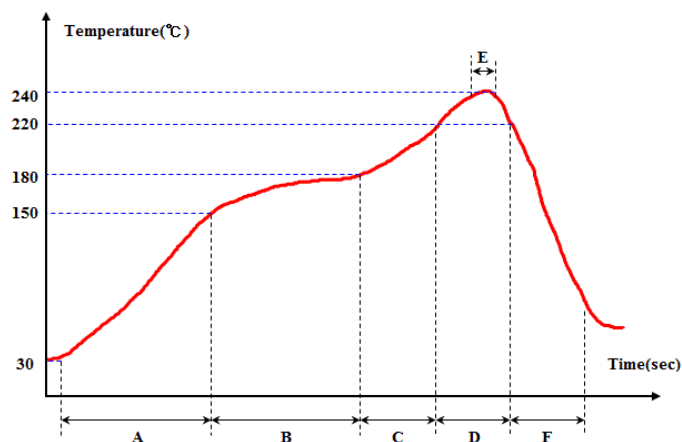
Reflow Profile

* Reflow oven settings

Zone	A	B	C	D	E	F
Temperature(°C)	30 ~ 150 °C	150 ~ 180 °C	180 ~ 220 °C	220 ~ 240 °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

Reflow Cycle Limit= 1time

* Measured reflow profile



Ordering Information

Part Number	Package Design
HT2121-15M	-R (Reel)
	-B (Bulk)
	-EVB (Evaluation Board)

Revision History

Part Number	Release Date	Version	Modification	Data Sheet Status
HT2121-15M	2013.04.05	1.0	Operating Voltage & Input Level (2p)	-
HT2121-15M	2013.02.25	0.2	Application Circuit Package Dimensions Reflow profile	Preliminary
HT2121-15M	2013.01.15	0.1	Initial Release of Data sheet	Preliminary

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