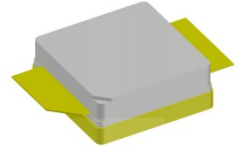


Product Features

- 2110~2170MHz
- 220W Saturated Power @ 48V
- 75% Drain Efficiency @ Psat
- 38% Drain Efficiency @ 47dBm
- Internally Matched

Applications

- WiMAX, LTE, WCDMA, GSM
- Multi-Band, Multi-Mode
- Multi-Carrier
- High Efficiency, Doherty Amplifier



Package Type : NS-AS01

Typical Single-Carrier LTE Performance ($V_{DS}=+48V$, $T_C=25^\circ C$, 50Ω)

Frequency [MHz]	Peak Power		Average Power ^{*1}			
	Power [W]	Drain Efficiency [%]	Power [W]	Gain [dB]	Drain Efficiency [%]	ACLR [dBc]
2115.0	258.8	75.3	50	17.3	39.0	-31.5
2140.0	243.8	74.3	50	17.4	40.0	-30.8
2165.0	228.0	72.4	50	17.2	39.7	-30.1

Note

*1 Measured in the IE21220P test board amplifier circuit, under LTE 10MHz, PAR 7.5dB @0.01% probability on CCDF

Absolute Maximum Ratings

Rating	Symbol	Value	Unit	Condition
Drain to Source Voltage	V_{DSS}	150	V	$T_C=25^\circ C$
Gate to Source Voltage	V_{GS}	-10, +2	V	$T_C=25^\circ C$
Operating Voltage	V_{DD}	52	V_{DC}	-
Maximum Forward Gate Current	I_{GMAX}	32	mA	$T_C=25^\circ C$
Maximum Drain Current ^{*1}	I_{DMAX}	12	A	$T_C=25^\circ C$
Power Dissipation	P_{DISS}	105	W	$T_C=85^\circ C$
Storage Temperature	T_{STG}	-65, +150	$^\circ C$	-
Case Operating Temperature	T_C	-40, +150	$^\circ C$	30 seconds
Operating Junction Temperature ^{*2}	T_J	225	$^\circ C$	-
Soldering Temperature ^{*3}	T_S	245	$^\circ C$	-

Note

*1 Current Limit for long term, reliable operation.

*2 Continuous use at maximum temperature will affect MTTF.

*3 Refer to the Application Note(AN-002) on soldering - "Solder Condition for RFHIC's GaN Device"

Thermal Characteristics

Rating	Symbol	Value	Unit	Condition
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.33 ^{*1}	$^\circ C/W$	$T_C=85^\circ C$

Note

*1 Measured for the IE21220P at dissipation power of 105.1W.

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
DC Characteristics ^{*1}						
Gate Threshold Voltage	$V_{DS} = 10\text{V}$	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V_{DC}
	$I_D = 28.8\text{mA}$					
Gate Quiescent Voltage	$V_{DS} = 48\text{V}$	$V_{GS(Q)}$	-	-2.8	-	V_{DC}
	$I_D = 1000\text{mA}$					
Saturated Drain Current ^{*2}	$V_{DS} = 6\text{V}$	I_{DS}	24.0	28.8	-	A
	$V_{GS} = 2\text{V}$					
Drain-Source Breakdown Voltage	$V_{GS} = -8\text{V}$	V_{BR}	150	-	-	V
	$I_D = 28.8\text{mA}$					
Gate Leakage Current	$V_{GS} = -8\text{V}$	I_{GLKG}	-6.3	-	-	mA
	$V_{DS} = 120\text{V}$					
Drain Leakage Current	$V_{GS} = -8\text{V}$	I_{DLKG}	-	-	11.5	mA
	$V_{DS} = 120\text{V}$					
RF Characteristics ($F_C=2140\text{MHz}$ unless otherwise noted)						
Saturated Output Power ^{*3,6}	$V_{DS} = 48\text{V}$	P_{SAT}	-	220	-	W
	$I_{DQ} = 1000\text{mA}$					
Pulsed Drain Efficiency ^{*3}	$V_{DS} = 48\text{V}$	η	70	75	-	%
	$I_{DQ} = 1000\text{mA}$					
	$P_{OUT} = P_{SAT}$ Pulsed					
Modulated Gain ^{*4}	$V_{DS} = 48\text{V}$	G_{BR}	16.0	17.0	-	dB
	$I_{DQ} = 1000\text{mA}$					
	$P_{OUT} = 47\text{dBm}$					
LTE Linearity ^{*4}	$V_{DS} = 48\text{V}$	ACLR	-	-31.0	-27.0	dBc
	$I_{DQ} = 1000\text{mA}$					
	$P_{OUT} = 47\text{dBm}$					
Modulated Drain Efficiency ^{*4}	$V_{DS} = 48\text{V}$	η	34.0	38.0	-	%
	$I_{DQ} = 1000\text{mA}$					
	$P_{OUT} = 47\text{dBm}$					
Output Mismatch Stress ^{*3,5}	$V_{DS} = 48\text{V}$	VSWR	-	-	10:1	ψ
	$I_{DQ} = 1000\text{mA}$					
	$P_{OUT} = P_{SAT}$ Pulsed					

Note

*1 Measured on wafer prior to packaging.

*2 Scaled from PCM data.

*3 Pulse width 100 μsec , Duty Cycle 10%.

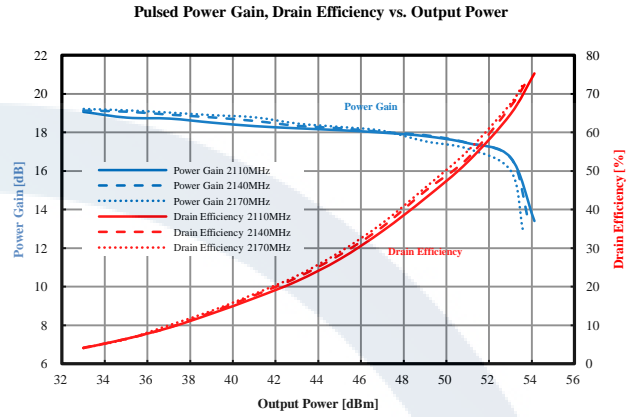
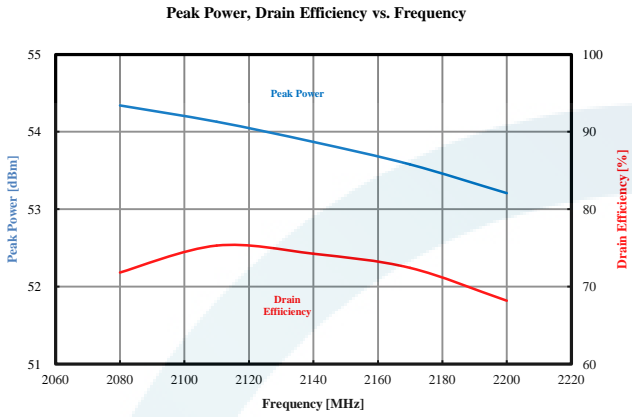
*4 Measured in the IE21220P test board amplifier circuit, under LTE 10MHz, PAR7.5dB @0.01% probability on CCDF.

*5 Measured in the IE21220P test board amplifier circuit. No damage at all phase angles.

*6 Psat is defined as $\Delta P_{out}/\Delta P_{in} < 0.1$, where ΔP_{in} is increased input power, ΔP_{out} is increased output power.

Typical Pulsed Signal Performance

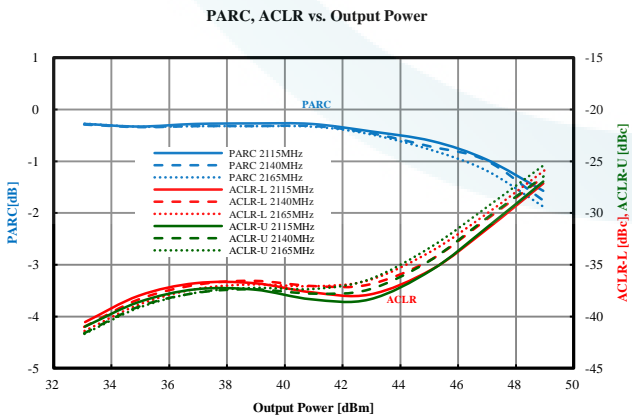
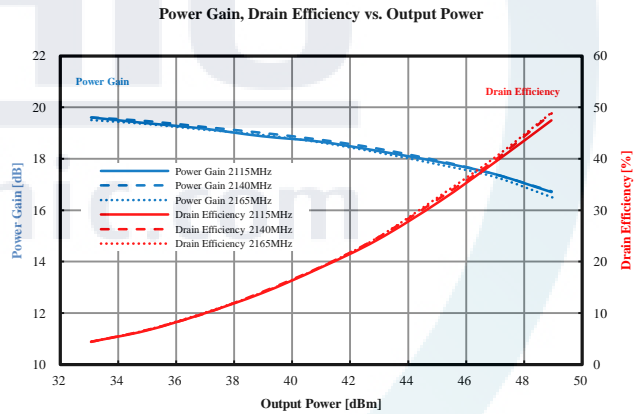
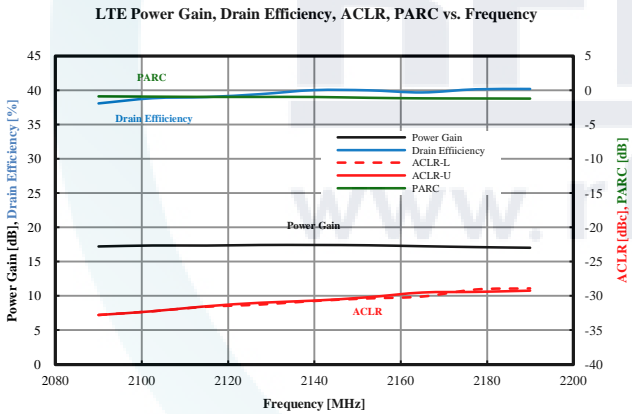
(Tc=25°C, Measured in the IE21220P test board amplifier circuit)



$V_{DS} = 48V$, $I_{DQ} = 1000mA$, Pulse Width = 100µsec, Duty Cycle = 10%

Typical LTE Signal Performance

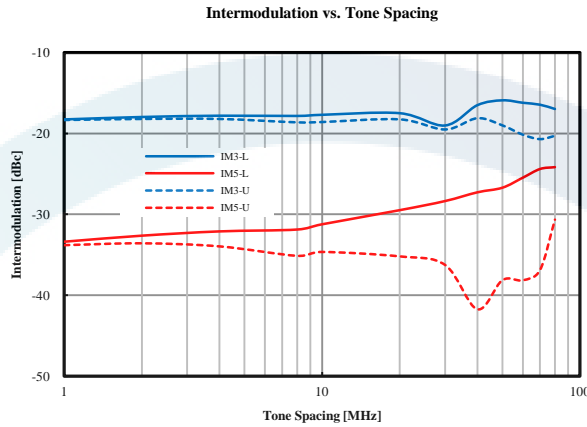
(Tc=25°C, Measured in the IE21220P test board amplifier circuit)



$P_{AVG} = 47dBm$, $V_{DS} = 48V$, $I_{DQ} = 1000mA$
 LTE 10MHz BW, PAPR=7.5dB @ 0.01% Probability on CCDF

Typical 2-tone Intermodulation Imbalance Performance

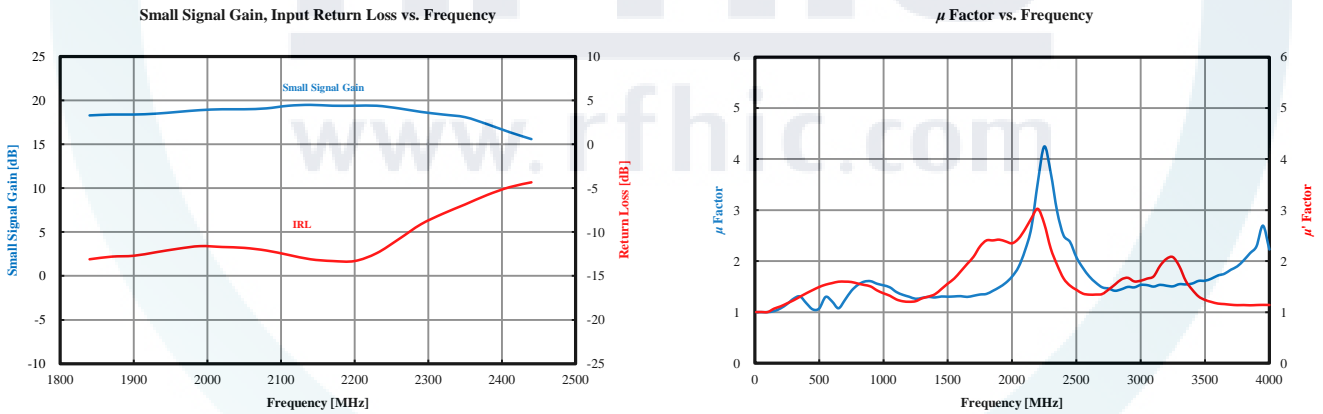
(Tc=25 °C, Measured in the IE21220P test board amplifier circuit)



2-tone Power = 51.4dBm, V_{DS} = 48V, I_{DQ} = 1000mA

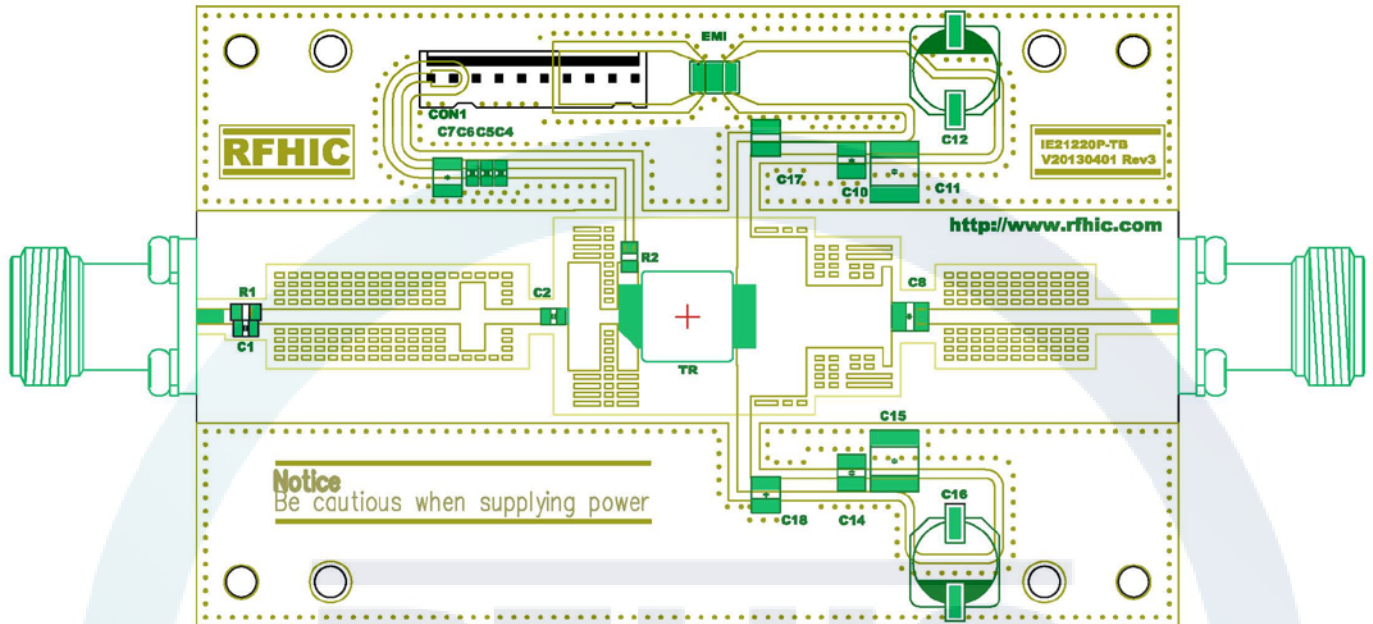
Typical Small Signal Performance

(Tc=25 °C, Measured in the IE21220P test board amplifier circuit)



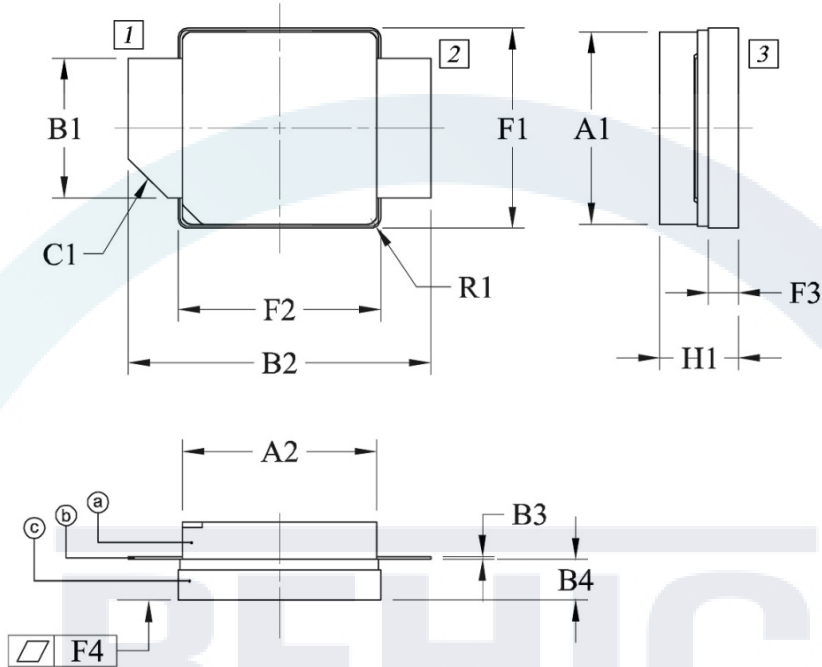
P_{IN} = 0dBm, V_{DS} = 48V, I_{DQ} = 1000mA

Test Board Component Layout



Part	Description	Part Number	Manufacturer
R1,R2	10 ohm Chip Resistor	MCR10EZHZJ100	ROHM
C1,C2	10pF High Q Capacitor	201CHA100JSLE	TEMEX
C4	10pF Chip Capacitor	GRM1885C1H100JA01D	MURATA
C5	10nF Chip Capacitor	GRM188R71H103KA01D	MURATA
C6	100nF Chip Capacitor	GRM188R71H104KA93D	MURATA
C7	Polymer Capacitor	TCJB476M010R0070	AVX
C12, C16	33uF Aluminum Capacitor	BDS100VC33MJ10TP	SAMYOUNG
C11, C15	10uF MLCC	RS80R2A106M	MARUWA
C10, C14	56pF High Q Capacitor	501CHB560JSLE	TEMEX
C17, C18	22pF High Q Capacitor	501CHB220JSLE	TEMEX
C8	12pF High Q Capacitor	501CHB120JSLE	TEMEX
EMI	EMI FILTER	CTH32R102S20A-TM	MARUWA
CON1	DC Connector	22-04-1101	MOLEX
PCB	$\epsilon_r=3.66 \pm 0.05, 0.030'' (0.762mm)$	RO4350B	ROGERS Corp.
TR	220W GaN Transistor	IE21220P	RFHIC

Package Dimensions (Type: NS-AS01)



Pin Description	
Pin No	Function
1	Gate
2	Drain
3	Source

- Ⓐ- Lid
- Ⓑ- Lead Frame
- Ⓒ- Flange

Dim.	INCH			MILLIMETER		
	MIN	TYP	MAX	MIN	TYP	MAX
A1	.380	.384	.390	9.65	9.75	9.90
A2	.380	.384	.390	9.65	9.75	9.90
B1	.274	.280	.285	6.97	7.10	7.23
B2	.579	.598	.618	14.70	15.20	15.70
B3	.004	.005	.007	0.10	0.13	0.18
B4	.080	.085	.090	2.03	2.15	2.28
C1 (Chamfer)	.075	.079	.083	1.90	2.00	2.10
F1	.395	.400	.405	10.03	10.16	10.29
F2	.395	.400	.405	10.03	10.16	10.29
F3	.054	.059	.000	1.37	1.50	1.63
F4	-	.001	-	-	0.03	-
H1	.148	.159	-	3.75	4.05	4.25
L1	-	-	-	-	-	-
L2	-	-	-	-	-	-
R1 (Radius)	.016	.020	.024	0.40	0.50	0.60

Revision History

Part Number	Release Date	Version	Description	Data Sheet Status
IE21220P	April, 2016	1.0	Initial Release of Data sheet	-



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