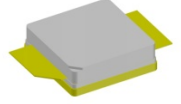


Product Features

- 3480~3520MHz
- 220W Saturated Power @ 48V
- 64% Drain Efficiency @ Psat
- 34% Drain Efficiency @ 47dBm
- Internally Matched

Applications

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



Package Type : RF12002KR3

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]
3485.0	265.5	63.7	50	14.6	34.0	-30.3
3500.0	249.5	64.6	50	14.7	34.8	-29.6
3515.0	238.8	64.1	50	14.7	35.7	-29.5

Note

*1 Measured in the IE36220W 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}	112	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	$R_{\theta JC}$	1.25 ^{*1}	$^\circ C/W$	$T_C = 85^\circ C$

Note

*1 Measured for the IE36220W at dissipation power is 112W.

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} = 10V	V _{GS(TH)}	-3.8	-3.0	-2.3	V _{DC}
	I _D = 28.8mA					
Gate Quiescent Voltage	V _{DS} = 48V	V _{GS(Q)}	-	-2.6	-	V _{DC}
	I _D = 1000mA					
Saturated Drain Current ^{*2}	V _{DS} = 6V	I _{DS}	24.0	28.8	-	A
	V _{GS} = 2V					
Drain-Source Breakdown Voltage	V _{GS} = -8V	V _{BR}	150	-	-	V
	I _D = 28.8mA					
Gate Leakage Current	V _{GS} = -8V	I _{GLKG}	-6.3	-	-	mA
	V _{DS} = 120V					
Drain Leakage Current	V _{GS} = -8V	I _{DLKG}	-	-	11.5	mA
	V _{DS} = 120V					
RF Characteristics (Fc=3500MHz unless otherwise noted)						
Saturated Output Power ^{*3,6}	V _{DS} = 48V	P _{SAT}	-	220	-	W
	I _{DQ} = 1000mA					
Pulsed Drain Efficiency ^{*3}	V _{DS} = 48V	η	61.0	64.0	-	%
	I _{DQ} = 1000mA					
	P _{OUT} = P _{SAT} Pulsed					
Modulated Gain ^{*4}	V _{DS} = 48V	G _{BR}	13.5	14.5	-	dB
	I _{DQ} = 1000mA					
	P _{OUT} = 47dBm					
LTE Linearity ^{*4}	V _{DS} = 48V	ACLR	-	-29.0	-27.0	dBc
	I _{DQ} = 1000mA					
	P _{OUT} = 47dBm					
Modulated Drain Efficiency ^{*4}	V _{DS} = 48V	η	32.0	34.0	-	%
	I _{DQ} = 1000mA					
	P _{OUT} = 47dBm					
Output Mismatch Stress ^{*3, 5}	V _{DS} = 48V	VSWR	-	-	10:1	ψ
	I _{DQ} = 1000mA					
	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%.

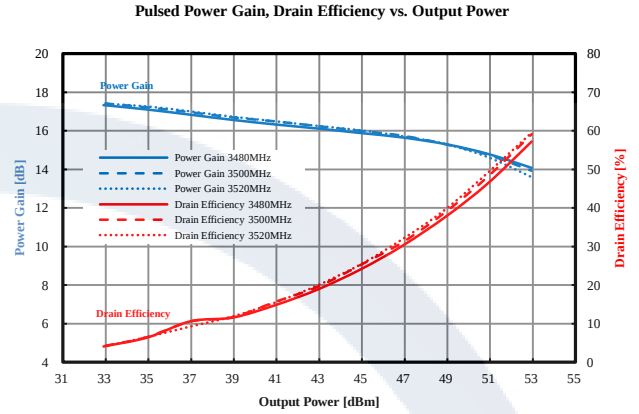
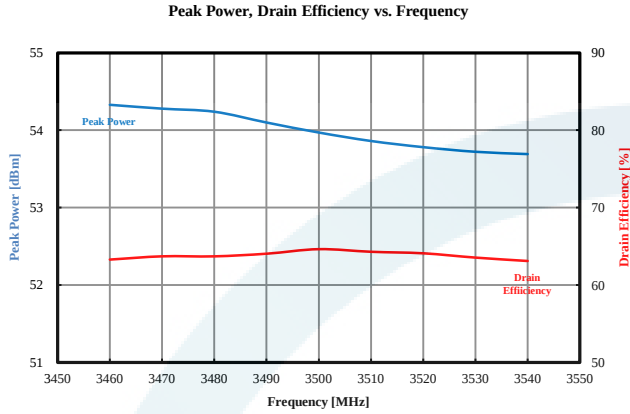
*4 Measured in the IE36220W test board amplifier circuit, under LTE 10MHz, PAR7.5dB @0.01% probability on CCDF.

*5 Measured in the IE36220W 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.

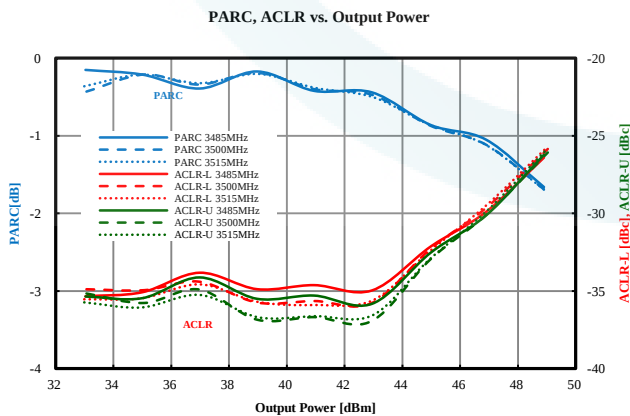
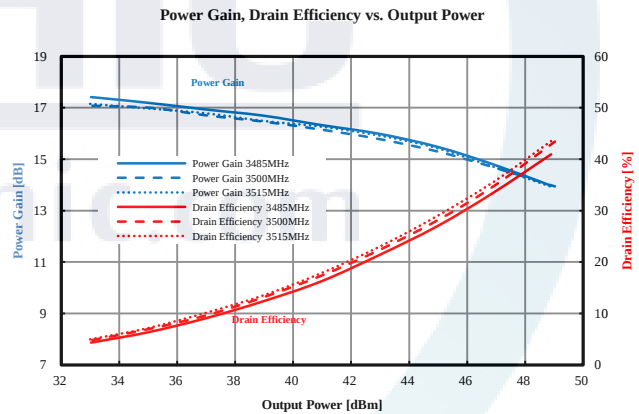
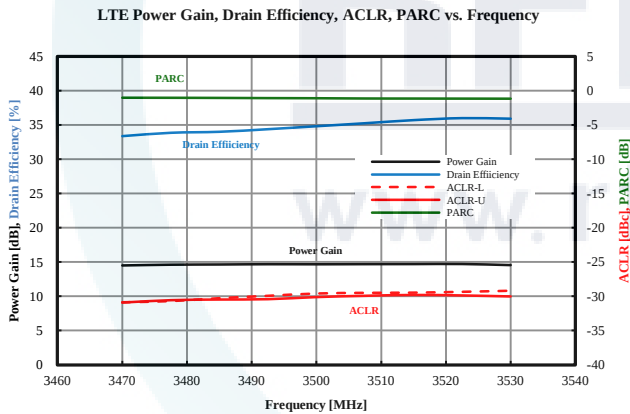
Typical Pulsed Signal Performance

(Tc=25°C, Measured in the IE36220W test board amplifier circuit)


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

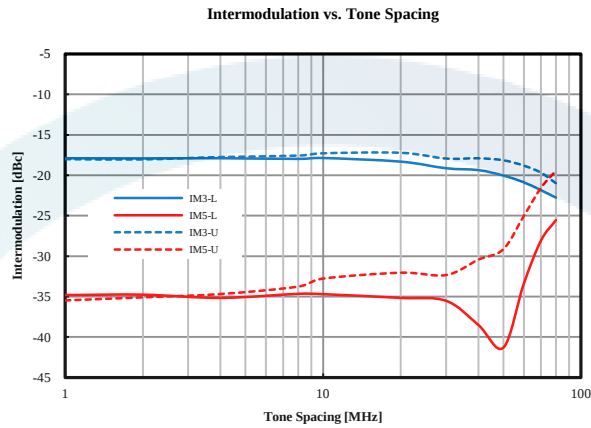
Typical LTE Signal Performance

(Tc=25°C, Measured in the IE36220W 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

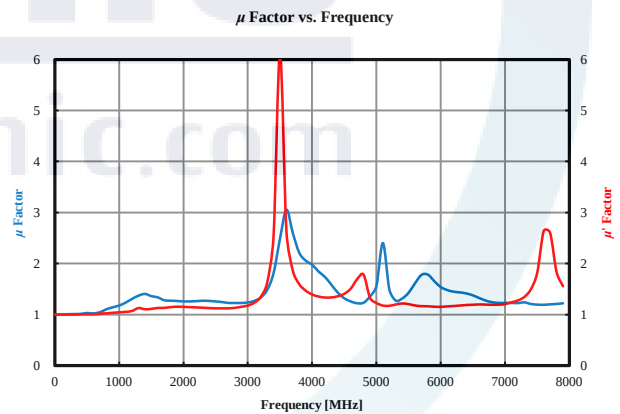
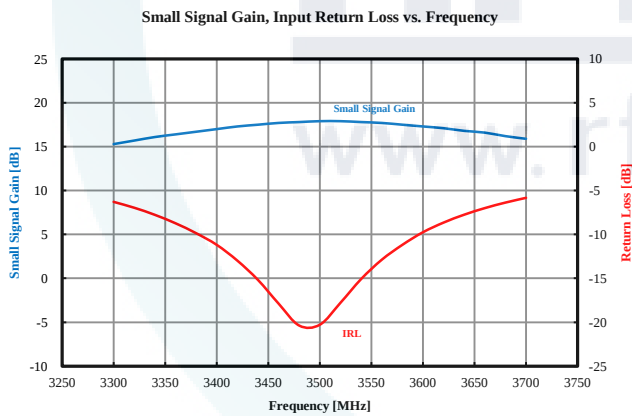
(Tc=25 °C, Measured in the IE36220W test board amplifier circuit)



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

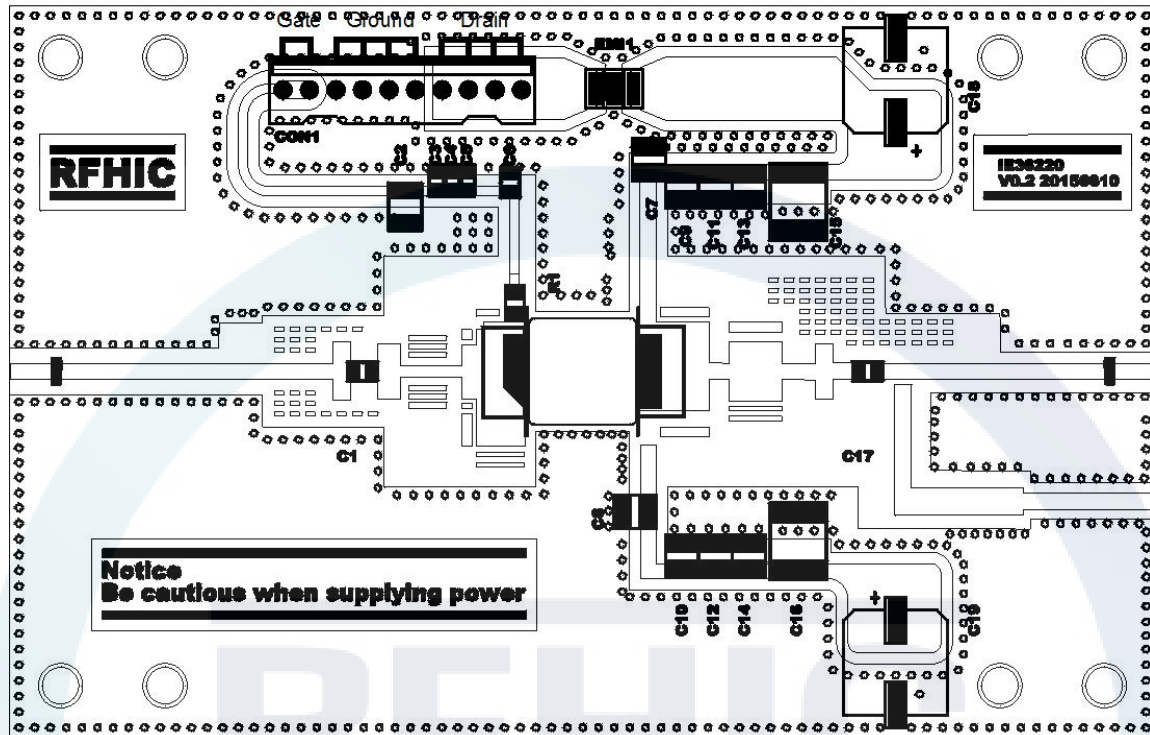
Typical Small Signal Performance

(Tc=25 °C, Measured in the IE36220W test board amplifier circuit)



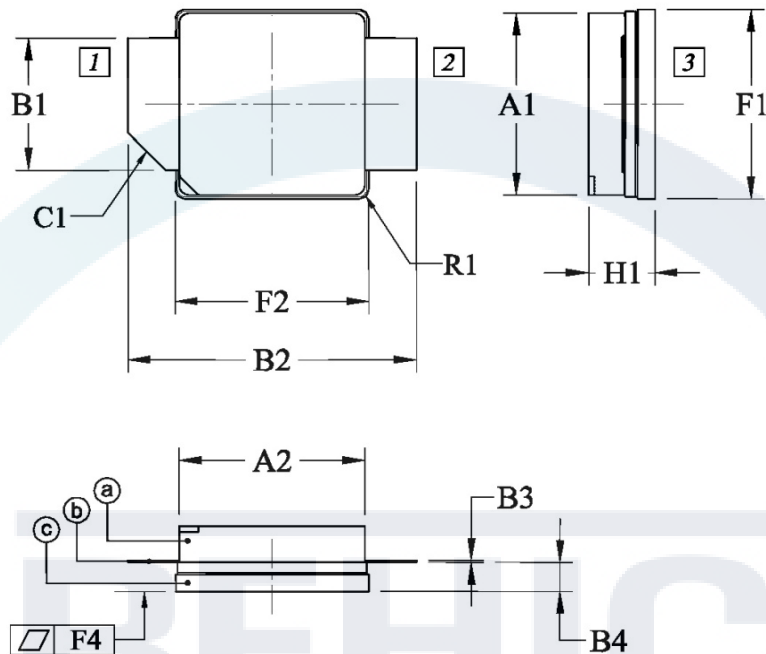
$P_{IN} = 0dBm$, $V_{DS} = 48V$, $I_{DQ} = 1000mA$

Test Board Component Layout



Part	Description	Part Number	Manufacturer
R1	10 ohm Chip Resistor	MCR10EZPJ100	ROHM
C1,C17	2.7pF High Q Capacitor	201CHA2R7CSLE	TEMEX
C2	47uF Polymer Capacitor	TCJB476M010R0070	AVX
C3	10nF Chip Capacitor	GRM188R71H103KA01D	MURATA
C4	1nF Chip Capacitor	GRM188R71H102KA01D	MURATA
C5	100pF Chip Capacitor	GRM1885C1H101JA01D	MURATA
C6	6.8pF Chip Capacitor	201CHA6R8CSLE	TEMEX
C7	5.6pF High Q Capacitor	501CHB5R6CSLE	TEMEX
C8,C10,C12	-	-	-
C14,C16,C19	-	-	-
C9	39pF High Q Capacitor	501CHB390JSLE	TEMEX
C11	100pF High Q Capacitor	501CHB101JSLE	TEMEX
C13	0.1uF Chip Capacitor	C2012X7R2A104K	TDK
C15	10uF MLCC	RS80R2A106M	MARUWA
C18	33uF Aluminum Capacitor	BDS100VC33MJ10TP	SAMYOUNG
EMI1	EMI FILTER	CTH32R102S20A-TM	MARUWA
CON1	DC Connector	5045-10	MOLEX
PCB	$\epsilon_r=3.48 \pm 0.05$, 0.030" (0.762mm)	RO4350B	ROGERS Corp.
TR1	220W GaN Transistor	IE36220W	RFHIC

Package Dimensions (Type:RF12002KR3)



Pin Description	
Pin No	Function
1	Gate
2	Drain
3	Source

- a- Lid
 b- Lead Frame
 c- 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	.058	.063	.068	1.48	1.60	1.73
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	-	-	-	-	-	-
F4	-	.001	-	-	0.03	-
H1	.118	.126	.138	3.00	3.20	3.50
L1	-	-	-	-	-	-
L2	-	-	-	-	-	-
R1 (Radius)	.016	.020	.024	0.40	0.50	0.60

Revision History

Part Number	Release Date	Version	Description	Data Sheet Status
IE36220W	March, 2016	1.0	Modified Thermal Characteristics	-



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