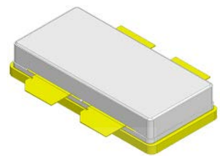
Product Features

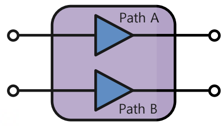
- 1805~1880MHz
- 330W Saturated Power @ 48V
- 57% Drain Efficiency @ 48dBm
- Internally Matched
- Symmetrical Doherty GaN HEMT

Applications

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



Package Type : RF24001DKR3



Typical Single-Carrier LTE Performance (V_{DS}= +48V, T_C=25℃, 50Ω)

Frequency [MHz]	Peak Power	Average Power*1			
	Power [W]	Power [W]	Gain [dB]	Drain Efficiency [%]	ACLR [dBc]
1810.0	353.2	63	16.0	56.9	-24.2
1842.5	352.4	63	15.5	57.7	-25.2
1875.0	341.2	63	15.2	56.2	-26.4

Note

*1 Measured in the IE18330D Doherty 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	Tc=25℃
Gate to Source Voltage	V_{GS}	-10, +2	V	Tc=25℃
Operating Voltage	V_{DD}	52	V_{DC}	-
Storage Temperature	T_{STG}	-65, +150	℃	-
Case Operating Temperature	T_C	-40, +150	℃	30 seconds
Operating Junction Temperature*1	T_J	225	℃	-
Soldering Temperature*2	T_S	245	℃	-

Note

*1 Continuous use at maximum temperature will affect MTTF.

*2 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	$R_{\theta JC}$	1.65 *1	℃/W	Tc=85℃

Note

*1 Measured for the IE18330D at dissipation power of 84.8W.

Electrical Characteristics (T_C=25℃ unless otherwise noted)

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
DC Characteristics - Path A (Carrier)[*1]						
Maximum Forward Gate Current	**Tc= 25℃**	I_{GMAX}	-	-	24.0	mA
Maximum Drain Current[*2]	**Tc= 25℃**	I_{DMAX}	-	-	9.0	A
Power Dissipation	**Tc= 85℃**	P_{DMAX}	-	-	84.8	W
Gate Threshold Voltage	**V_{DS} = 10V** **I_D = 21.6mA**	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V_{DC}
Gate Quiescent Voltage	**V_{DS} = 48V** **I_D = 750mA**	$V_{GS(Q)}$	-	-2.7	-	V_{DC}
Drain-Source Breakdown Voltage	**V_{GS} = -8V** **I_D = 21.6mA**	V_{BR}	150	-	-	V
Saturated Drain Current[*3]	**V_{DS} = 6V** **V_{GS} = 2V**	I_{DS}	18.0	21.6	-	A
Gate Leakage Current	**V_{GS} = -8V** **V_{DS} = 120V**	I_{GLKG}	-4.8	-	-	mA
Drain Leakage Current	**V_{GS} = -8V** **V_{DS} = 120V**	I_{DLKG}	-	-	8.6	mA
DC Characteristics - Path B (Peaking)[*1]						
Maximum Forward Gate Current	**Tc= 25℃**	I_{GMAX}	-	-	24.0	mA
Maximum Drain Current[*2]	**Tc= 25℃**	I_{DMAX}	-	-	9.0	A
Power Dissipation	**Tc= 85℃**	P_{DMAX}	-	-	84.8	W
Gate Threshold Voltage	**V_{DS} = 10V** **I_D = 21.6mA**	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V_{DC}
Gate Quiescent Voltage	**V_{DS} = 48V** **I_D = 750mA**	$V_{GS(Q)}$	-	-2.7	-	V_{DC}
Drain-Source Breakdown Voltage	**V_{GS} = -8V** **I_D = 21.6mA**	V_{BR}	150	-	-	V
Saturated Drain Current[*3]	**V_{DS} = 6V** **V_{GS} = 2V**	I_{DS}	18.0	21.6	-	A
Gate Leakage Current	**V_{GS} = -8V** **V_{DS} = 120V**	I_{GLKG}	-4.8	-	-	mA
Drain Leakage Current	**V_{GS} = -8V** **V_{DS} = 120V**	I_{DLKG}	-	-	8.6	mA

Note

*1 Measured on wafer prior to packaging.

*2 Current Limit for long term, reliable operation.

*3 Scaled from PCM data.

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
RF Characteristics (Fc=1842.5MHz unless otherwise noted)						
Saturated Output Power[*1,4]	V_{DS} = 48V I_{DQ} = 750mA	P_{SAT}		330	-	W
Modulated Gain[*2]	V_{DS} = 48V I_{DQ} = 750mA P_{OUT} = 48dBm	G_{BR}	14.0	15.0	-	dB
LTE Linearity[*2]	V_{DS} = 48V I_{DQ} = 750mA P_{OUT} = 48dBm	ACLR	-	-25.0	-23.0	dBc
Modulated Drain Efficiency[*2]	V_{DS} = 48V I_{DQ} = 750mA P_{OUT} = 48dBm	η	55.0	57.0	-	%
Output Mismatch Stress[*1, 3]	V_{DS} = 48V I_{DQ} = 750mA P_{OUT} = P_{SAT} Pulsed	VSWR	-	-	10:1	ψ

Note

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

*2 Measured in the IE18330D Doherty test board amplifier circuit, under LTE 10MHz, PAR7.5dB @0.01% probability on CCDF.

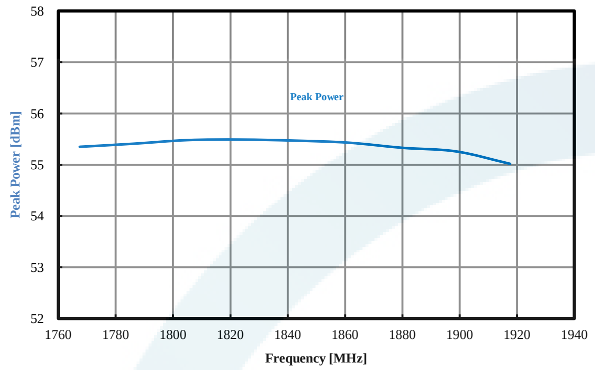
*3 Measured in the IE18330D Doherty test board amplifier circuit. No damage at all phase angles.

*4 Psat is defined as ΔPout/ΔPin<0.1, where ΔPin is increased input power, ΔPout is increased output power.

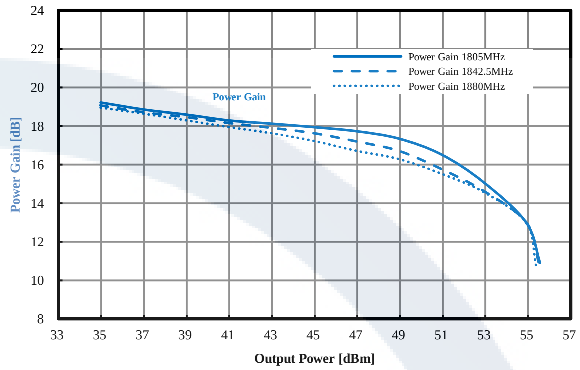
Typical Pulsed Signal Performance

(Tc=25℃, Measured in the IE18330D test board amplifier circuit)

Peak Power vs. Frequency



Pulsed Power Gain vs. Output Power

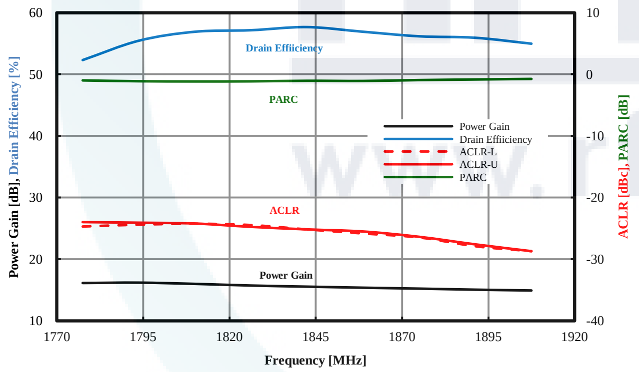


V_{DS} = 48V, $I_{DQ(C)}$ = 750mA, $V_{GS(P)}$=-4.5V, Pulse Width = 100μsec, Duty Cycle = 10%

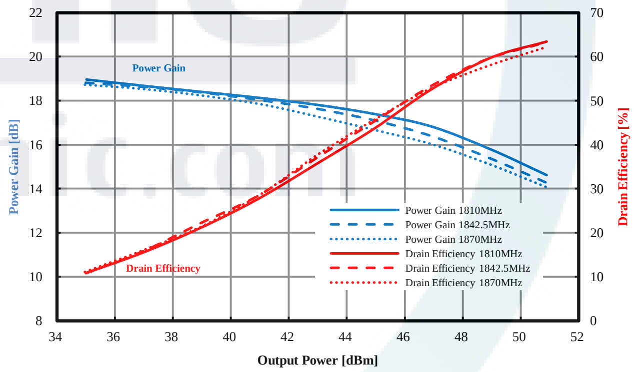
Typical LTE Signal Performance

(Tc=25℃, Measured in the IE18330D test board amplifier circuit)

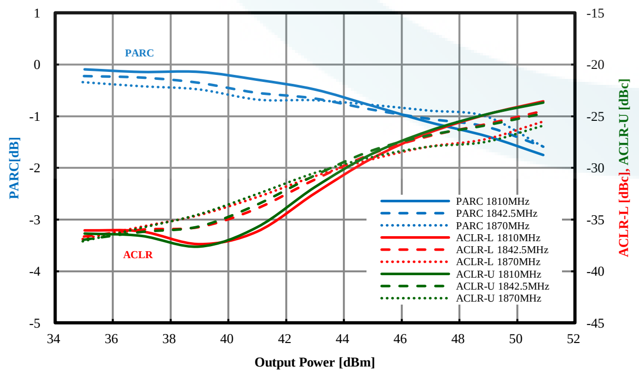
LTE Power Gain, Drain Efficiency, ACLR, PARC vs. Frequency



Power Gain, Drain Efficiency vs. Output Power



PARC, ACLR vs. Output Power

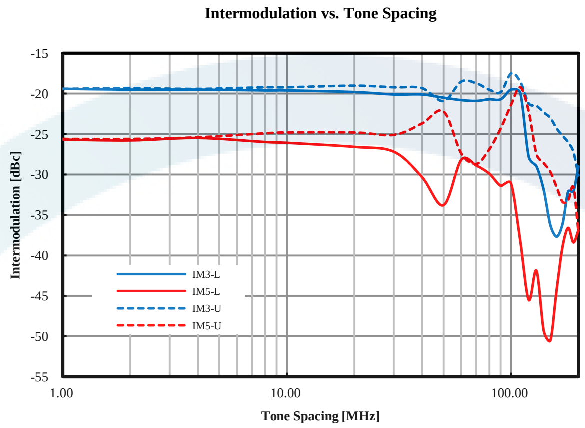


P_{AVG} = 48dBm, V_{DS} = 48V, $I_{DQ(C)}$ = 750mA, $V_{GS(P)}$ = -4.5V

LTE 10MHz BW, PAPR=7.5dB @ 0.01% Probability on CCDF

Typical 2-tone Intermodulation Imbalance Performance

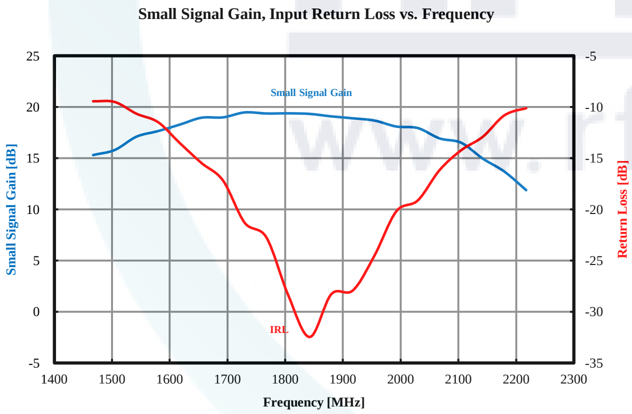
(Tc=25℃, Measured in the IE18330D Doherty test board amplifier circuit)

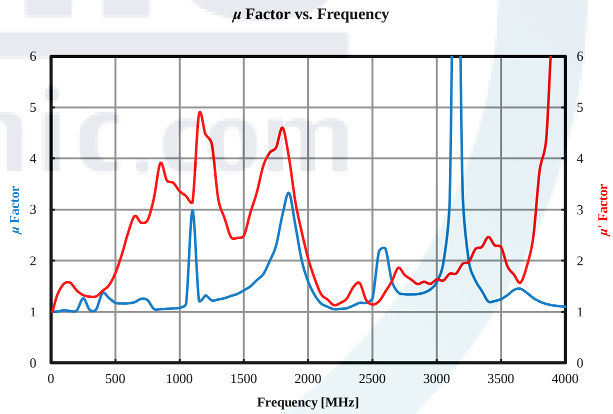


2-tone Power = 53.2dBm, V_{DS} = 48V, $I_{DQ(C)}$ = 750mA, $V_{GS(P)}$ = -4.5V

Typical Small Signal Performance

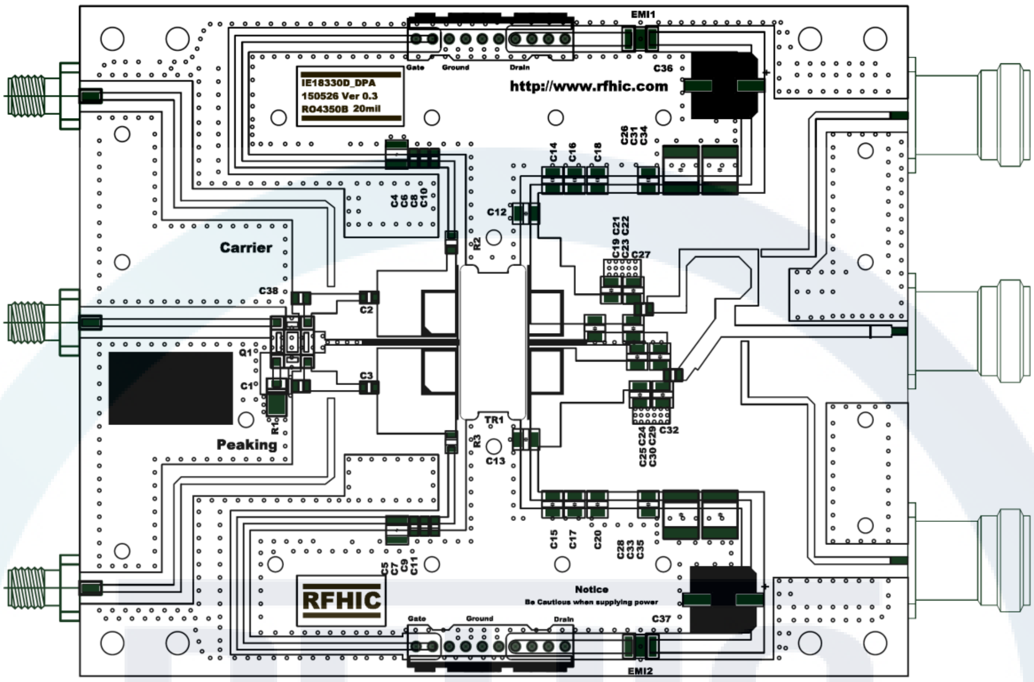
(Tc=25℃, Measured in the IE18330D Doherty test board amplifier circuit)





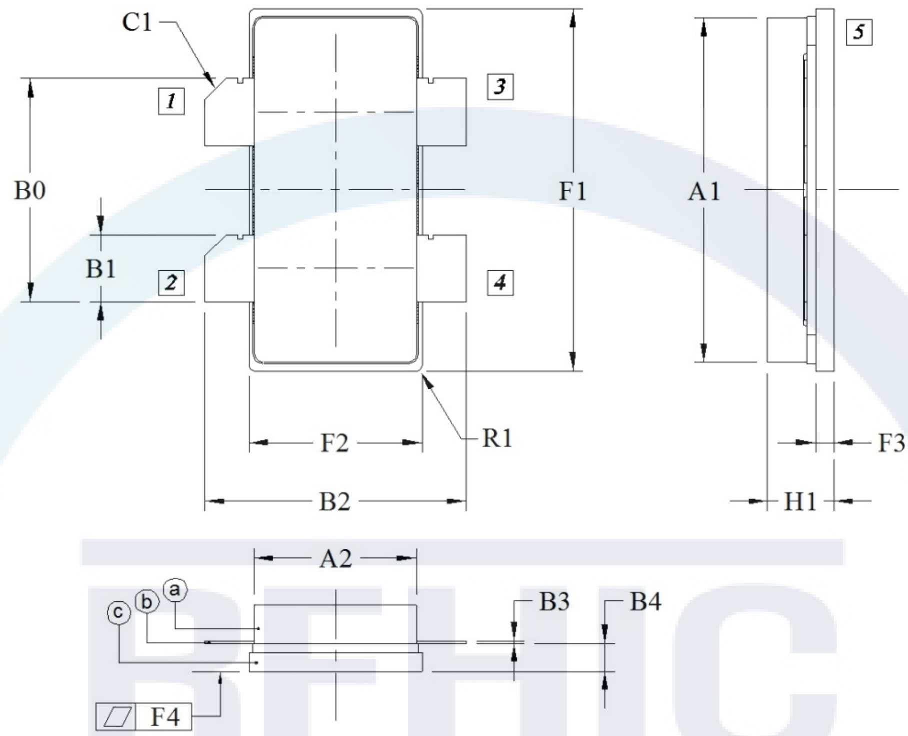
P_{IN} = 0dBm, V_{DS} = 48V, I_{DQ} = 750mA, $V_{GS(P)}$ = -4.5V

Test Board Component Layout



Part	Description	Part Number	Manufacturer
R1	50 ohm Power Resistor	45-0040S	DICONEX
R2, R3	10 ohm Chip Resistor	MCR10EZPJ100	ROHM
C1	1.5pF High Q Capacitor	201CHA1R5CSLE	TEMEX
C2,C32	15pF High Q Capacitor	201CHA150JSLE	TEMEX
C3	100pF High Q Capacitor	201CHA101JSLE	TEMEX
C4,C5	10uF Polymer Capacitor	TCJA106M016R0200	AVX
C6,C7	10nF Chip Capacitor	GRM188R71H103KA01D	MURATA
C8,C9	1nF Chip Capacitor	GRM188R71H102KA01D	MURATA
C10,C11	100pF Chip Capacitor	GRM1885C1H101JA01D	MURATA
C12,C13,C19	0.5pF High Q Capacitor	201CHB0R5BSLE	TEMEX
C14, C15	10pF High Q Capacitor	201CHB100JSLE	TEMEX
C16,C17,C21,C24,C2	-	-	-
C18,C20	100pF High Q Capacitor	201CHB101JSLE	TEMEX
C22,C23	1.0pF High Q Capacitor	201CHB1R0BSLE	TEMEX
C26,C28	1000pF High Q Capacitor	201CHB102JSLE	TEMEX
C27	5.1pF High Q Capacitor	201CHA5R1CSLE	TEMEX
C30	0.3pF High Q Capacitor	201CHB0R3BSLE	TEMEX
C31,C33,C34,C35	10uF MLCC	RS80R2A106M	MARUWA
C36,C37	33uF Aluminum Capacitor	BDS100VC33MJ10TP	SAMYOUNG
C38	0.5pF High Q Capacitor	201CHA0R5BSLE	TEMEX
Q1	Hybrid Coupler	CMX19Q02	RN2
EMI1, EMI2	EMI FILTER	CTH32R102S20A-TM	MARUWA
CON1, CON2	DC Connector	22-04-1101	MOLEX
PCB	εr=3.66 ± 0.05, 0.020” (0.508mm)	RO4350B	ROGERS Corp.
TR1	330W GaN Transistor	IE18330D	RFHIC

Package Dimensions (Type:RF24001DKR3)



Pin Description	
Pin No	**Function**
1	Path A Gate
2	Path B Gate
3	Path A Drain
4	Path B Drain
5	Source

ⓐ- Lid

ⓑ- Lead Frame

ⓒ- Flange

Dim.	INCH			MILLIMETER		
	MIN	TYP	MAX	MIN	TYP	MAX
A1	0.767	0.772	0.777	19.48	19.61	19.74
A2	0.357	0.362	0.367	9.07	9.2	9.33
B0	0.495	0.5	0.505	12.57	12.7	12.83
B1	0.145	0.15	0.155	3.68	3.81	3.94
B2	0.58	0.584	0.589	14.72	14.84	14.97
B3	0.003	0.005	0.007	0.08	0.13	0.18
B4	0.057	0.062	0.067	1.44	1.57	1.7
C1 (Chamfer)	0.042	0.047	0.052	1.07	1.2	1.33
F1	0.806	0.811	0.816	20.47	20.6	20.73
F2	0.381	0.386	0.391	9.67	9.8	9.93
F3	0.031	0.036	0.041	0.79	0.92	1.05
F4	-	0.002	-	-	0.04	-
H1	0.127	0.148	0.17	3.22	3.77	4.32
R1 (Radius)	0.022	0.026	0.03	0.55	0.65	0.75

Revision History

Part Number	Release Date	Version	Description	Data Sheet Status
IE18330D	March, 2016	1.0	Modified Electrical Characteristics	-