Preliminary

GaN Power Transistors

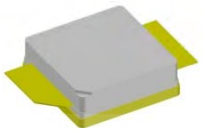
IE18085P

Product Features

- 1805~1880MHz
- 85W Saturated Power @ 48V
- 72% Drain Efficiency @ Psat
- 36% Drain Efficiency @ 42.8dBm

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℃, 50Ω)

Frequency [MHz]	Peak Power		Average Power*1			
	Power [W]	Drain Efficiency [%]	Power [W]	Gain [dB]	Drain Efficiency [%]	ACLR [dBc]
1810.0	107.2	78.1	19	19.3	37.7	-29.7
1842.5	104.7	72.2	19	18.9	36.6	-31.5
1875.0	94.4	78.0	19	19.4	40.5	-28.8

Note

*1 Measured in the IE18085P 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}	55	V_{DC}	-
Maximum Forward Gate Current	I_{GMAX}	12	mA	Tc=25℃
Maximum Drain Current*1	I_{DMAX}	4.5	A	Tc=25℃
Power Dissipation	P_{DISS}	48	W	Tc=85℃
Storage Temperature	T_{STG}	-65, +150	℃	-
Case Operating Temperature	T_C	-40, +150	℃	30 seconds
Operating Junction Temperature*2	T_J	250	℃	-
Soldering Temperature*3	T_S	245	℃	-

Note

*1 Current Limit for long term, reliable operation.

*2 Continuous use at maximum temperature will affect MTTF. The recommended maximum T_J is 225℃

*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	$R_{\theta JC}$	2.90 *1	℃/W	Tc=85℃

Note

*1 Measured for the IE18085P at dissipation power of 48W. This is the maximum value.

Electrical Characteristics (T_C=25℃ unless otherwise noted)

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
DC Characteristics[*1]						
Gate Threshold Voltage	V_{DS} = 10V I_D = 10.8mA	$V_{GS(TH)}$	-3.55	-3.1	-2.65	V_{DC}
Gate Quiescent Voltage	V_{DS} = 48V I_D = 350mA	$V_{GS(Q)}$	-3.15	-2.85	-2.55	V_{DC}
Saturated Drain Current[*2]	V_{DS} = 6V V_{GS} = 2V	I_{DS}	9.0	10.8	-	A
Drain-Source Breakdown Voltage	V_{GS} = -8V I_D = 10.8mA	V_{BR}	150	-	-	V
Gate Leakage Current	V_{GS} = -8V V_{DS} = 120V	I_{GLKG}	-2.4	-	-	mA
Drain Leakage Current	V_{GS} = -8V V_{DS} = 120V	I_{DLKG}	-	-	4.3	mA
RF Characteristics (Fc=1842.5MHz unless otherwise noted)						
Saturated Output Power[*3,6]	V_{DS} = 48V I_{DQ} = 350mA	P_{SAT}	-	85	-	W
Pulsed Drain Efficiency[*3]	V_{DS} = 48V I_{DQ} = 350mA P_{OUT} = P_{SAT} Pulsed	η	67	72	-	%
Modulated Gain[*4]	V_{DS} = 48V I_{DQ} = 350mA P_{OUT} = 42.8dBm	G_{BR}	17.0	19.0	-	dB
LTE Linearity[*4]	V_{DS} = 48V I_{DQ} = 350mA P_{OUT} = 42.8dBm	ACLR	-	-28.0	-26.0	dBc
Modulated Drain Efficiency[*4]	V_{DS} = 48V I_{DQ} = 350mA P_{OUT} = 42.8dBm	η	33.0	36.0	-	%
Output Mismatch Stress[*3, 5]	V_{DS} = 48V I_{DQ} = 350mA P_{OUT} = P_{SAT} Pulsed	VSWR	-	-	10:1	ψ

Note

*1 Measured on wafer prior to packaging.

*2 Scaled from PCM data.

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

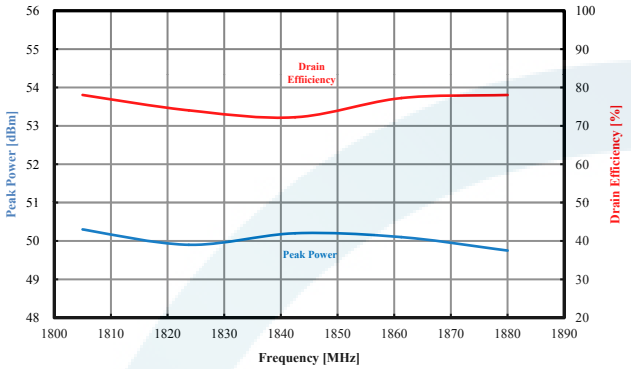
*4 Measured in the IE18085P test board amplifier circuit, under LTE 10MHz, PAR7.5dB @0.01% probability on CCDF.

*5 Measured in the IE18085P test board amplifier circuit. No damage at all phase angles.

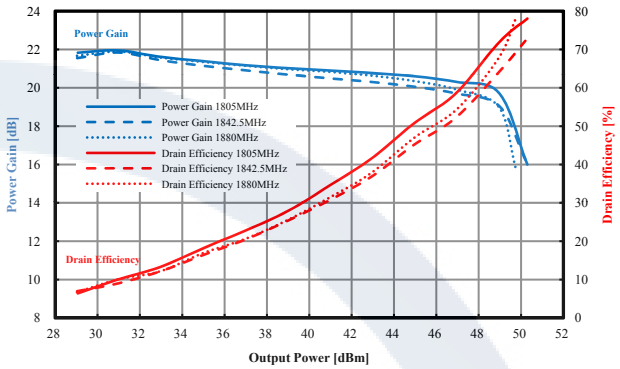
*6 Psat is defined as ΔPout/ΔPin<0.1, where ΔPin is increased input power, ΔPout is increased output power.

Typical Pulsed Signal Performance (Tc=25℃, Measured in the IE18085P test board amplifier circuit)

Peak Power, Drain Efficiency vs. Frequency



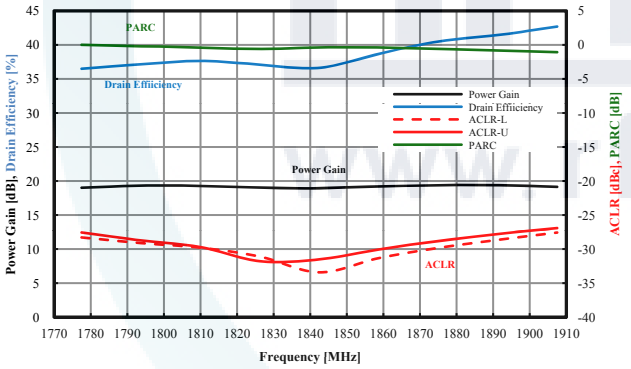
Pulsed Power Gain, Drain Efficiency vs. Output Power



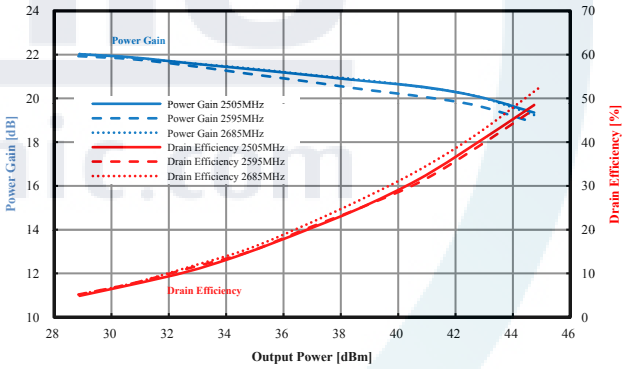
V_{DS} = 48V, I_{DQ} = 350mA, Pulse Width = 100μsec, Duty Cycle = 10%

Typical LTE Signal Performance (Tc=25℃, Measured in the IE18085P test board amplifier circuit)

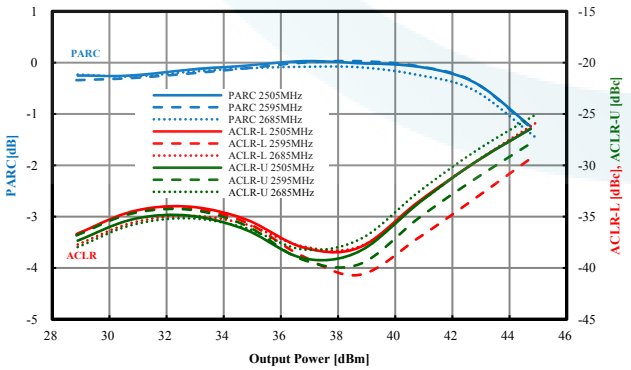
LTE Power Gain, Drain Efficiency, ACLR, PARC vs. Frequency



Power Gain, Drain Efficiency vs. Output Power



PARC, ACLR vs. Output Power

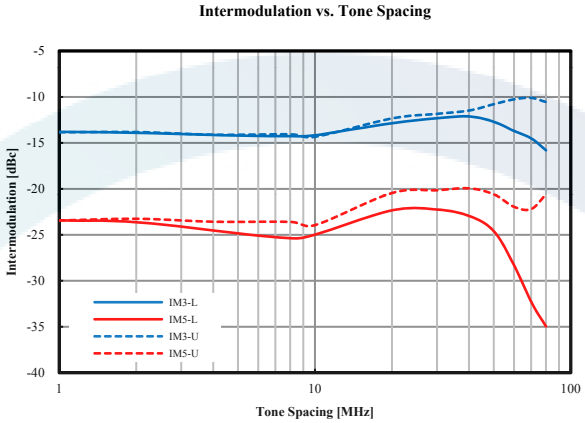


P_{AVG} = 42.8dBm, V_{DS} = 48V, I_{DQ} = 350mA

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

Typical 2-tone Intermodulation Imbalance Performance

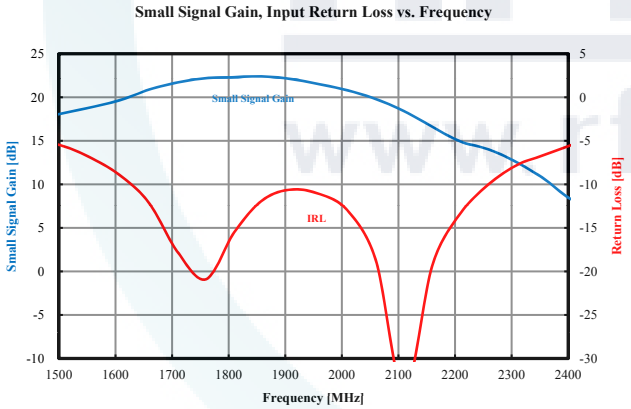
(Tc=25℃, Measured in the IE18085P test board amplifier circuit)

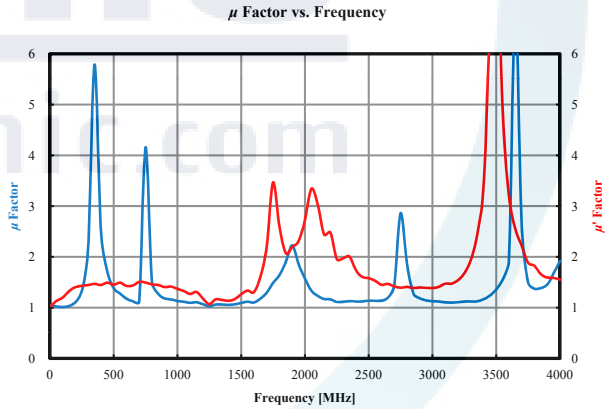


2-tone Power = 47.3dBm, V_{DS} = 48V, I_{DQ} = 350mA

Typical Small Signal Performance

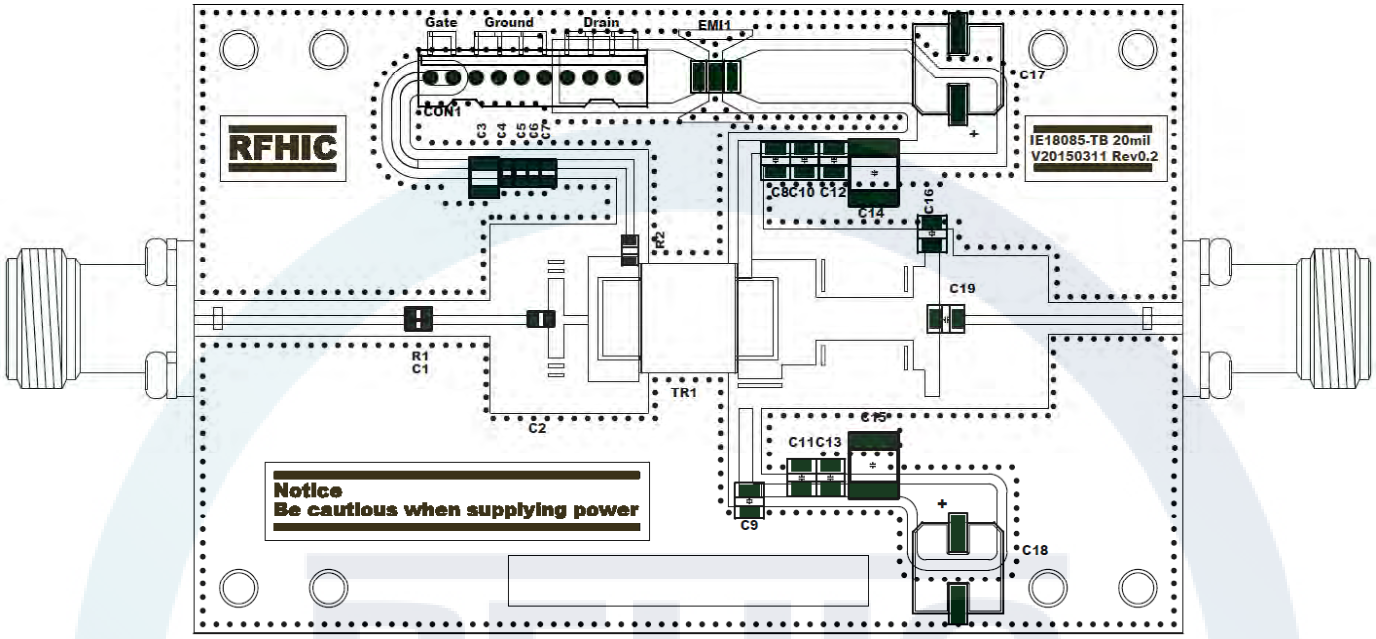
(Tc=25℃, Measured in the IE18085P test board amplifier circuit)





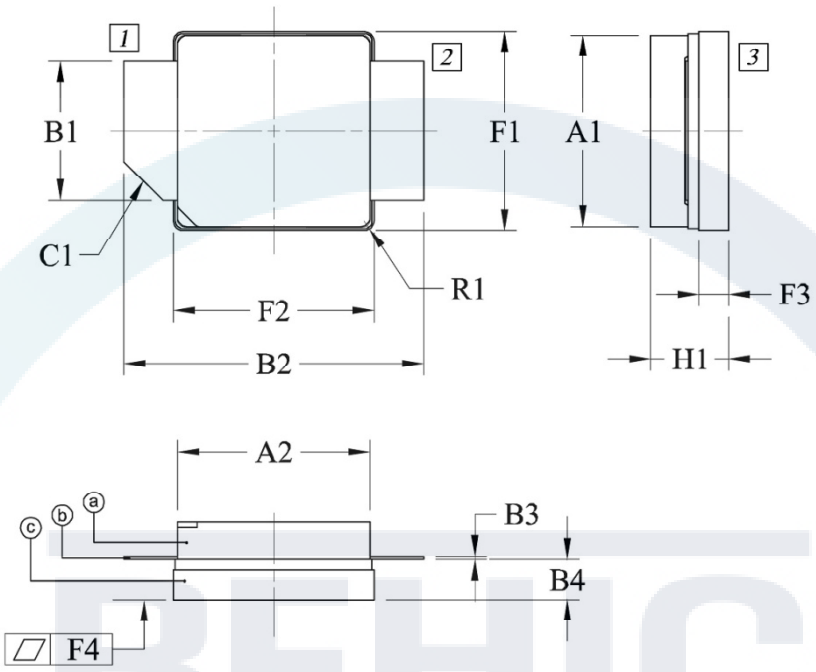
P_{IN} = 0dBm, V_{DS} = 48V, I_{DQ} = 350mA

Test Board Component Layout



Part	Description	Part Number	Manufacturer
R1	100 ohm Chip Resistor	MCR10 EZHJ101	ROHM
R2	20 ohm Chip Resistor	MCR10 EZHJ200	ROHM
C1	5.6pF High Q Capacitor	201CHA5R6CSLE	TEMEX
C2	10pF High Q Capacitor	201CHA100JSLE	TEMEX
C3	Polymer Capacitor	TCJB476M010R0070	AVX
C4	100nF Chip Capacitor	GRM188R71H104KA01D	MURATA
C5	10nF Chip Capacitor	GRM188R71H103KA01D	MURATA
C6	10pF Chip Capacitor	GRM1885C1H100JA01D	MURATA
C10	22pF High Q Capacitor	501CHB220JSLE	TEMEX
C14	10uF MLCC	RS80R2A106M	MARUWA
C16	1pF High Q Capacitor	501CHB1R0BSLE	TEMEX
C17	33uF Aluminum Capacitor	BDS100VC33MJ10TP	SAMYOUNG
C19	18pF High Q Capacitor	501CHB180JSLE	TEMEX
C7, C8, C9, C11, C12	-	-	-
C13, C15, C18	-	-	-
EMI1	1000pF EMI Filter	CTH32R102S20A	MARUWA
CON1	DC Connector	5045-10	MOLEX
PCB	εr=3.48 ± 0.05, 0.020” (0.508mm)	RO4350B	ROGERS Corp.
TR1	85W GaN Transistor	IE18085H	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	.064	1.37	1.50	1.63
F4	-	.001	-	-	0.03	-
H1	.148	.159	.167	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
IE18085P	April, 2015	0.1	Initial Release of Data sheet	Preliminary

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