

CPJ07A

80W, 3.7-4.2 GHz Doherty Amplifier

Preliminary Datasheet

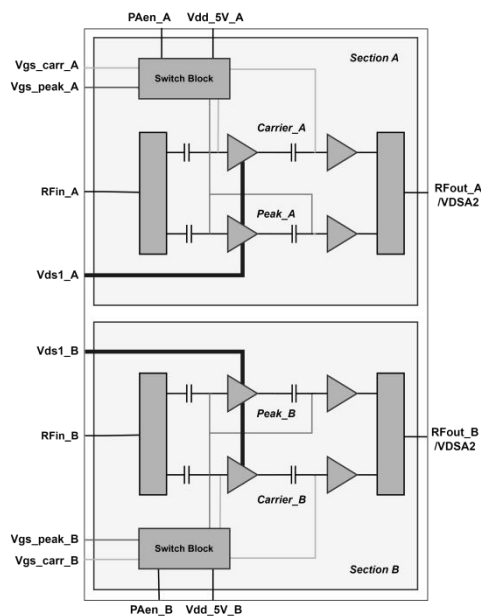
Description

The CPJ07A is a LDMOS integrated Asymmetrical Doherty 3-stage Power Amplifier designed for cellular base station applications with 80W saturated output power covering frequency range from 3.7-4.2GHz. The amplifier is 50Ω Input matched with integrated input divider and output combiner into a small compact footprint which makes it ideal for integration.



PQFN 12 x 7 x 2.1 mm, 36-pins

Block Diagram



Features

- Operating Frequency Range: 3700 - 4200 MHz
- Operating Drain Voltage: +26V
- P1dB: 70W (+48.4 dBm)
- P3dB: 80W (+49 dBm)
- 50 Ω Input matched
- Integrated Input Divider
- Integrated Output Combiner
- Integrated Bias Gate Switch
- Integrated Asymmetrical Doherty Final Stage
- High linearity
- High Gain
- Footprint: PQFN 12x7x2.1 mm, 36-pin

RF Characteristics (Pulsed CW)

Freq(MHz)	P1dB(dBm)	P3dB(dBm)	Gain(dB)*	PAE(%)*
3700	48.8	49.3	33.2	17.9
4000	49.0	49.5	33.1	17.9
4200	48.4	49.2	32.4	15.9

Test conditions unless otherwise noted: 25°C, 10% Pulse, PAen = 5 V, Vdd_5V = 5 V, Vds = 26 V, Idq_carr = 240 mA, Vgs_peak = Vgs_carr - 0.40 V, test on Watech Application Board.

*Pout=36dBm

RF Characteristics (WCDMA)

Freq(MHz)	Gain(dB)	PAE(%)	5MHz(dBc)*	10MHz(dBc)*
3700	33.0	19.2	-37.9	-55.8
4000	32.9	20.3	-38.2	-56.0
4200	32.1	19.0	-41.1	-56.3

Test conditions unless otherwise noted: 25°C, PAen = 5 V, Vdd_5V = 5 V, Vds = 26 V, Idq_carr = 240 mA, Vgs_peak = Vgs_carr - 0.40V, Pavg = 36 dBm, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on WATECH Application Board.

Absolute Maximum Ratings

Parameter	Range/Value	Units
Drain voltage (VDSS)	-0.5 to 65	V
Gate voltage (VGS)	-5 to 10	V
Storage Temperature (TSTG)	-55 to 150	°C
Junction Temperature (TJ)	-40 to 200	°C

Electrical Specification

DC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Breakdown Voltage V(BR)DSS	Vgs=0V, Ids=47uA	65	-	-	V
Gate-Source Threshold Voltage VGS(th)	Vds=28V, Ids=47uA	1.0	-	2.0	V
Drain Leakage Current IDSS	Vgs=0V, Vds=28V	-	-	TBD	uA
Gate Leakage Current IGSS	Vgs=5V, Vds=0V	-	-	TBD	uA

Test conditions unless otherwise noted: 25 °C

RF Characteristics (Pulsed CW)

Parameter	Conditions	Min	Typ	Max	Unit
P1dB	Freq=3.7GHz	TBD	TBD	TBD	dBm
P3dB	Freq=3.7GHz	TBD	TBD	TBD	dBm
IRL	Freq=3.7GHz, Pout=36dBm	TBD	TBD	TBD	dB
P1dB	Freq=4.2GHz	TBD	TBD	TBD	dBm
P3dB	Freq=4.2GHz	TBD	TBD	TBD	dBm
IRL	Freq=4.2GHz, Pout=36dBm	TBD	TBD	TBD	dB

Test conditions unless otherwise noted: 25°C, 10% Pulse, PAen = 5 V, Vdd_5V = 5 V, Vds = 26 V, Idq_carr = 240 mA, Vgs_peak = Vgs_carr - 0.40 V, test on WATECH Production Board.

RF Characteristics (WCDMA)

Parameter	Conditions	Min	Typ.	Max	Unit
Gain	Freq=3.7GHz, Pout=36dBm	TBD	TBD	TBD	dB
Eff	Freq=3.7GHz, Pout=36dBm	TBD	TBD	TBD	%
ACPR@5MHz	Freq=3.7GHz, Pout=36dBm	TBD	TBD	TBD	dBc
Gain	Freq=4.2GHz, Pout=36dBm	TBD	TBD	TBD	dB
Eff	Freq=4.2GHz, Pout=36dBm	TBD	TBD	TBD	%
ACPR@5MHz	Freq=4.2GHz, Pout=36dBm	TBD	TBD	TBD	dBc

Test conditions unless otherwise noted: 25°C, PAen = 5 V, Vdd_5V = 5 V, Vds = 26 V, Idq_carr = 240 mA, Vgs_peak = Vgs_carr - 0.40 V, Pavg = 36 dBm, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on WATECH Production Board.

Load Mismatch Test

Condition	Test Result
VSWR=10:1, at all Phase Angles, Vds=+26Vdc, PAen = 5 V, Vdd_5V = 5 V, Idq_carr = 240mA, Vgs_peak = Vgs_carr - 0.40 V, Pavg = 36 dBm, Frequency = 3.7 GHz, test on WATECH Application Board	TBD

Thermal Information

Parameter	Condition	Value (Typ)*	Unit
Thermal Resistance Junction to Case (Rth)	T _{CASE} = 90°C, 1C-WCDMA 5MHz Signal, 9.9dB PAR, PAVG = 36dBm	1.21	°C /W

* $R_{th} = (T_j - T_{case}) / (P_{dissA} + P_{dissB})$

Impedance Information

Freq (MHz)	ZL(Ω)*	P1dB(dBm)	Gp(max)(dB)	Eff(%)**	Eff(%)***
3700	TBD	TBD	TBD	TBD	TBD
4000	TBD	TBD	TBD	TBD	TBD
4200	TBD	TBD	TBD	TBD	TBD

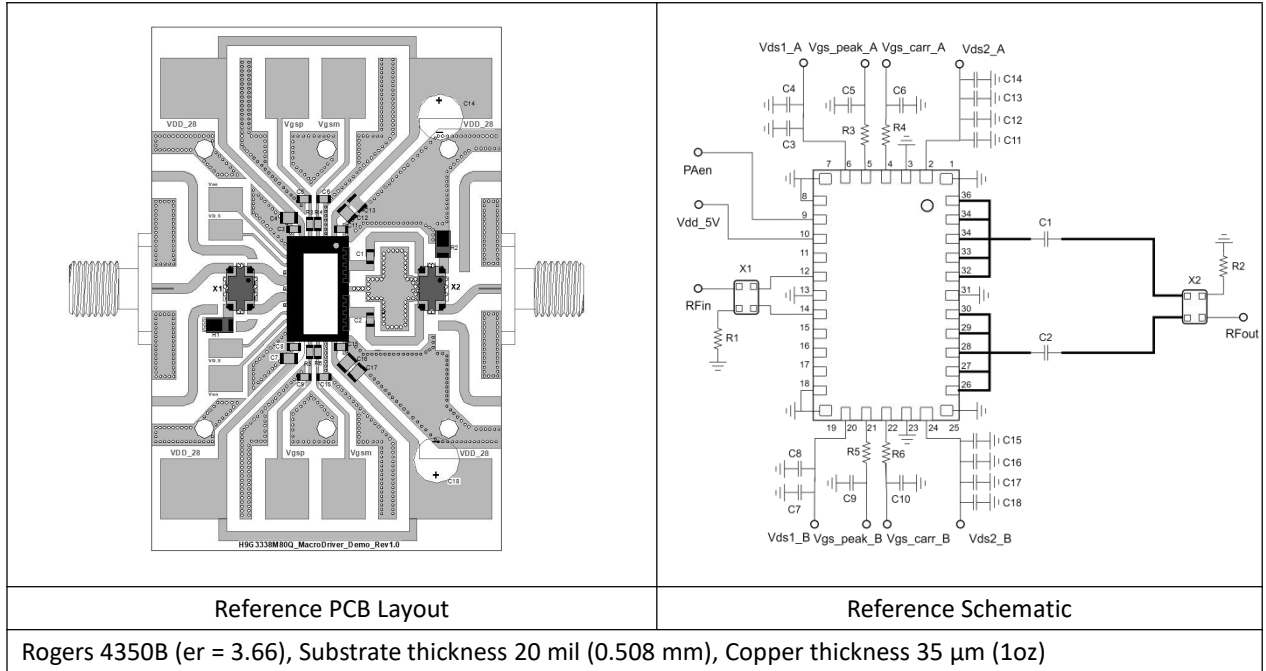
Measured Load-pull data per section, 25°C, 10% Pulse, PAen = 5 V, Vdd_5V = 5 V, Vds = 26 V, Idq_carr = 125 mA, Vgs_peak = Vgs_carr - 0.5 V, Pavg = 33 dBm,

*Reference package plane

**Pout=P1dB dBm

***Pout=33 dBm

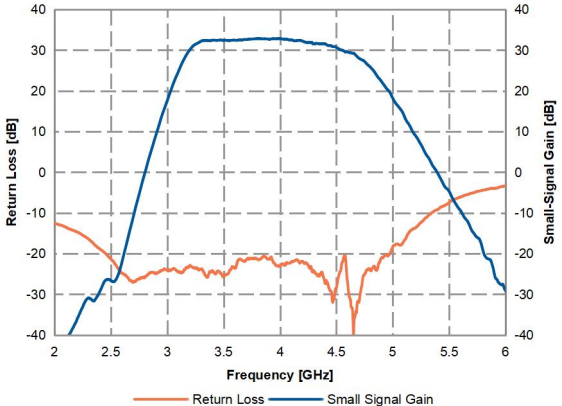
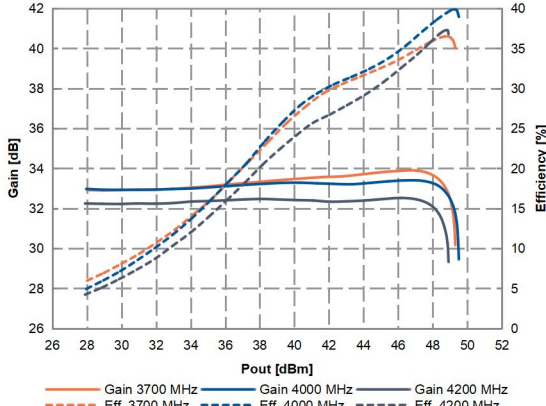
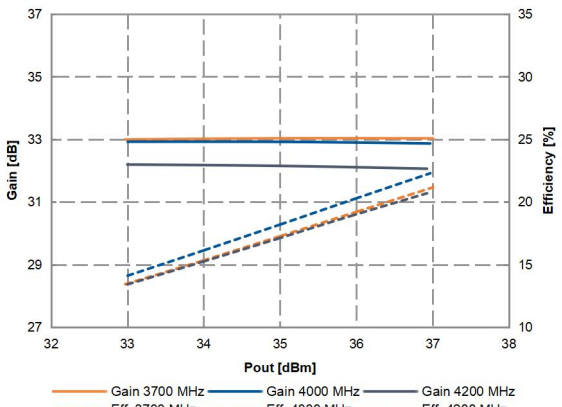
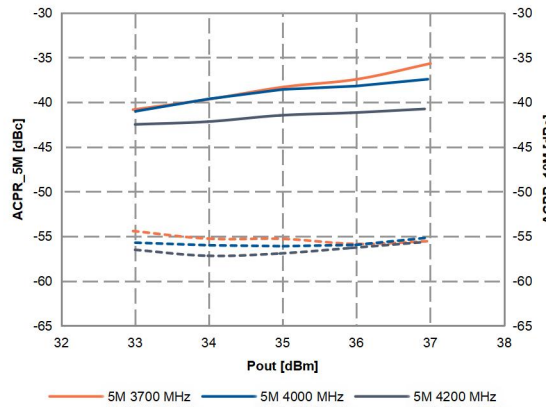
CPJ07A 3.7-4.2 GHz Reference Design



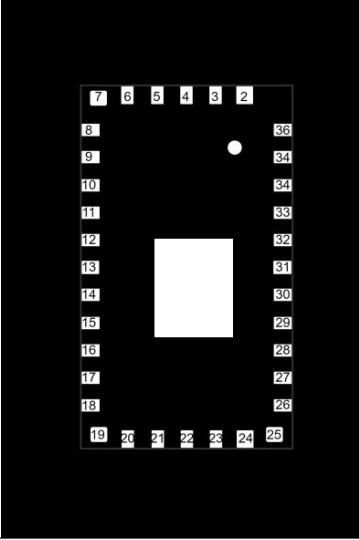
Bill of Materials (Bom) - CPJ07A 3.7-4.2 GHz Reference Design

Component	Type	Value	Description	P/N
R1, R2	Resistor	51ohm	Resistor	RC0402FR-0751RL
R3, R4, R5, R6	Resistor	33ohm	Resistor	RC0402FR-0733RL
C1, C2	Capacitor	0.8pF	0603, 250V	GQM1875G2E0R8BB12D
C3, C5, C6, C8-C10, C12, C16	Capacitor	1uF	0805, 100V	GRM21BC72A105KE01L
C11, C15	Capacitor	15pF	0603, 250V	GQM1875C2E150GB12D
C4, C7, C12, C16	Capacitor	10uF	1210, 100V	GRM32EC72A106KE05L
C14, C18	Capacitor	470uF	100V	Nichicon-UHE1E471MPD6
X1, X2	Coupler	3200-4200MHz	Coupler	X3C35F1-03S

Performance Plots

 Return Loss [dB] (orange solid line) and Small-Signal Gain [dB] (blue solid line) vs Frequency [GHz].	 Gain [dB] (solid lines) and Efficiency [%] (dashed lines) vs Pout [dBm] for 3700 MHz (orange), 4000 MHz (blue), and 4200 MHz (grey).
S-Parameter	Pulsed-CW performance(Gain+Eff vs Pout)
Test conditions, unless otherwise noted: 25°C, PAen = 5 V, Vdd_5V = 5 V, Vds = 26 V, Idq_carr = 240 mA, Vgs_peak = Vgs_carr - 0.40 V, Test on WATECH Application Board.	Test conditions, unless otherwise noted: 25°C, 10% Pulse, PAen = 5 V, Vdd_5V = 5 V, Vds = 26 V, Idq_carr = 240 mA, Vgs_peak = Vgs_carr - 0.40 V, Test on WATECH Application Board.
 Gain [dB] (solid lines) and Efficiency [%] (dashed lines) vs Pout [dBm] for 3700 MHz (orange), 4000 MHz (blue), and 4200 MHz (grey).	 ACPR_5M [dBc] (solid lines) and ACPR_10M [dBc] (dashed lines) vs Pout [dBm] for 5M (solid lines) and 10M (dashed lines) for 3700 MHz (orange), 4000 MHz (blue), and 4200 MHz (grey).
WCDMA performance(Gain + Eff vs Pout)	WCDMA performance(ACPR_5M + ACPR_10M vs Pout)
Test conditions unless otherwise noted: 25°C, PAen = 5 V, Vdd_5V = 5 V, Idq_carr = 240 mA, Vds = 26 V, Vgs_peak = Vgs_carr - 0.40 V, Pavg = 36dBm, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on WATECH Application Board.	

Pin Configuration and Description

		
Pin Configuration		
Pin Number	Label	Description
1	GND	Ground
2	Vds2_A	Drain-source voltage of final stages of section A
3	c.t.g	Ground
4	Vgs_carr_A	Gate-source voltage of carrier ^[1]
5	Vgs_peak_A	Gate-source voltage of peaking ^[2]
6	Vds1_A	Drain-source voltage of driver stages of section A
7	GND	Ground
8	n.c	Not connected
9	PAen_A	PA enable trigger signal, 0V to 5V ^[3]
10	Vdd_5V_A	Supply voltage 5V ^[4]
11	GND	Ground
12	RFin_A	RF input of section A
13	GND	Ground
14	RFin_B	RF input of section B
15	GND	Ground
16	Vdd_5V_B	Supply voltage 5V ^[4]
17	PAen_B	PA enable trigger signal, 0V to 5V ^[3]
18	n.c	Not connected
19	GND	Ground
20	Vds1_B	Drain-source voltage of driver stages of section B

21	Vgs_peak_B	Gate-source voltage of peaking ^[2]
22	Vgs_carr_B	Gate-source voltage of carrier ^[1]
23	c.t.g	Ground
24	Vds2_B	Drain-source voltage of final stages of section A
25	GND	Ground
26,27,28,29,30	RFout_B	RF output of section B
31	GND	Ground
32,33,34,35,36	RFout_A	RF output of section A
EPAD	GND	Ground

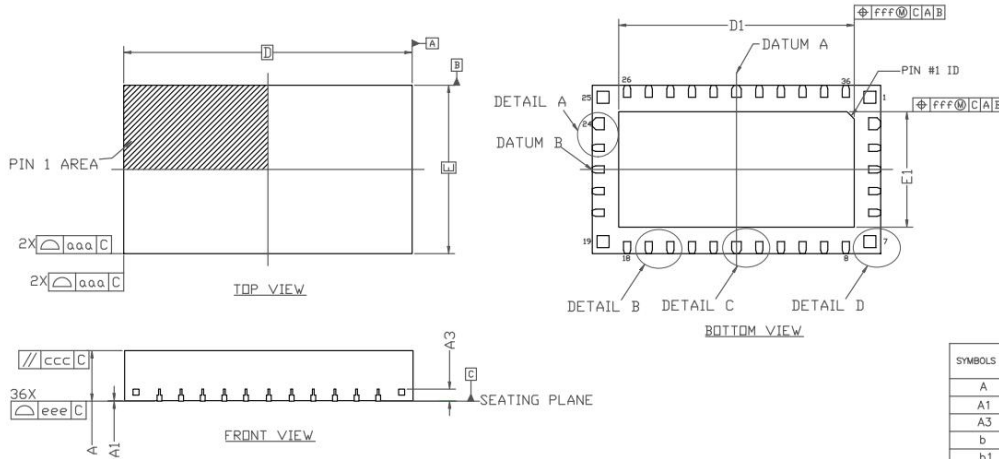
[1] Pins connected together inside package.

[2] Pins connected together inside package.

[3] Pins connected together inside package.

[4] Pins connected together inside package.

Marking



SYMBOLS	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	2.00	2.10	2.20	0.079	0.083	0.087
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.50	REF	0.020	REF		
b	0.425	0.500	0.575	0.017	0.020	0.023
b1	0.325	0.400	0.475	0.013	0.016	0.019
b2	0.225	0.300	0.375	0.009	0.012	0.015
b3	---	0.50	---	---	0.020	---
D	12.00	BSC	0.472	BSC		
E	7.00	BSC	0.276	BSC		
e	1.00	BSC	0.039	BSC		
e1	0.95	BSC	0.037	BSC		
e2	0.90	BSC	0.035	BSC		
D1	9.70	9.80	9.90	0.382	0.386	0.390
E1	4.70	4.80	4.90	0.185	0.189	0.193
K	0.20	---	---	0.008	---	---
K1	0.25	---	---	0.010	---	---
L	0.40	0.50	0.60	0.016	0.020	0.024
L1	---	0.50	---	---	0.020	---
aaa	0.15	---	---	0.006	---	---
bbb	0.10	---	---	0.004	---	---
ccc	0.10	---	---	0.004	---	---
ddd	0.05	---	---	0.002	---	---
eee	0.08	---	---	0.003	---	---
fff	0.10	---	---	0.004	---	---

Handling Precautions

Parameter	Grade		
Moisture Sensitivity Level MSL	3		
Parameter	Rating	Standard	
ESD – Human Body Model (HBM)	TBD	JESD22-A114	
ESD – Charged Device Model (CDM)	TBD	JESD22-C101	